SOUTHWESTERN
Power Group II, LLC
An Energy Company - Alliance Builder

RECEIVED

2003 JAN 30 A 11: 35

AZ CORP COMMISSION
DOCUMENT CONTROL

0000007756

Arizona Corporation Commission
DOCKETED

JAN 3 0 2003

DOCKETED BY

January 29, 2003

E-00000D-03-0047

Ms. Colleen Ryan, Supervisor
Document Control Center
Arizona Corporation Commission
1200 West Washington
Phoenix, Arizona 85007

Re: Annual Ten-Year Plan For Bowie Power Station, L.L.C.

Dear Ms. Ryan:

Pursuant to A.R.S. 40-360.02, Bowie Power Station L.L.C. ("Bowie") hereby submits its Ten-Year Plan for the proposed 1000 MW natural gas-fired combined cycle power plant and double circuit 345 kV line associated with the Bowie Project. This letter follows the same organization specified in A.R.S. 40-360.02, which is provided in Attachment A. The Requirements within the revised statutes are formatted in italics, and are followed by Bowie's response in normal (non-italicized) type.

1. ***The size and proposed route of any transmission lines or location of each plant proposed to be constructed.***

The Arizona Power Plant and Transmission Line Siting Committee granted Certificates of Environmental Compatibility (CEC) for both the power plant and transmission line aspect of the project on January 3, 2002. The Arizona Corporation Commission (Commission) confirmed these approvals on March 7, 2002. The approvals are docketed with the Commission in Case No. 118 (Docket L-00000BB-01-0118) as Decision No.'s 64625 and 64626. A description of the proposed power station and the transmission line is provided in Decision No.'s 64625 and 64626, respectively. The following excerpt is taken directly from each Decision to address Requirement "1" of the Ten-Year Plan.

Power Station-" A natural gas fired, combined cycle electric generating plant with an operating capability not to exceed a nominal site rating of 1000 megawatts (MW). The facilities shall consist of up to two (2) power blocks, each rated up to 500 MW nominal. Each power block shall consist of (i) two combustion turbine generators (CTG), (ii) two heat recovery steam generators (HRSG) and (iii) one steam turbine electric generator. The plant design may also incorporate supplementary or duct-firing of the HRSG for a given power block. The duct-firing design would be incorporated in the HRSG's. The power plant and supporting infrastructure shall be located in Section 28 and a portion of Section 29, Township 12 South, Range 28 East, G&SRB&M."

4350 East Camelback Road • Suite B175 • Phoenix, Arizona 85018
P.O. Box 15491 • Phoenix, Arizona 85060
888.332.4599 • Tel 602.808.2004 • Fax 602.808.2099
www.southwesternpower.com

Transmission Project- " (i) a double-circuit 345 kV transmission line, which shall interconnect Applicant's Bowie Power Station facilities with the Western Systems Coordinating Council ('WSCC") transmission grid at Tucson Electric Power Company's ("TEP") 345 kV Greenlee-Vail transmission line and Arizona Electric Power Company's ("AEPCO") 230 kV Red Tail-Dos Condados Transmission Line; and (ii) the new Willow 345/230 kV switchyard [Sec.14, T11S, R26E, G&SRB&M], through which the aforesaid interconnections will be accomplished. As testified to by the Applicant during public hearings, electric power and energy produced at the Bowie Power Station are intended primarily to serve Southeastern Arizona markets.

The double-circuit 345 kV transmission line hereby authorized shall originate at Applicant's Bowie Power Station and follow the route proposed by Applicant in its Application for a distance of approximately 14.3 miles to the point of interconnection with the proposed Willow switchyard. In that regard, Applicant is further authorized to use a 2500' wide corridor within which it will ultimately acquire up to a 250' wide right-of-way for purpose of siting and construction of the line. Exhibit "A" to this Decision and Certificate sets forth a generalized narrative legal description of the routing hereby approved for the double-circuit 345 kV transmission line. Exhibit "B", as attached hereto, consists of a map depicting the aforementioned 345 kV transmission line corridor."

2. *The purpose to be served by each proposed line or plant.*

Bowie Power Station LLC will interconnect to the Western System Coordinating Council system via creation of the new Willow switchyard on the existing Tucson Electric Power Company's ("TEP") Greenlee-Vail 345 kV line. From Bowie to Willow, a double circuit 345 kV will be constructed utilizing steel monopoles over a linear distance of approximately 14.3 miles. Willow will be constructed for a breaker and a half scheme but be operated as a four-element ring bus for the first power block (nominal 525 MW including duct-firing) of the Bowie station. Phase II of Bowie (second nominal 525 MW including duct-firing) will add the additional element of the Springerville – Vail line subject to TEP's two county rule financing situation.

This interconnection is intended to primarily serve markets in Southestern Arizona (i.e. Tucson and the east valley of Phoenix) and secondarily markets at the Palo Verde Hub (California), the Mead Hub (California and Nevada) and New Mexico utilities.

3. *The estimated date by which each transmission line or plant will be in operation.*

A decision to grant the Aquifer Protection Permit for Bowie was made by the Arizona Department of Environmental Quality (ADEQ) on January 2, 2003 and a preliminary decision to grant the Air Quality Class I Permit was made November 6, 2002. A public Hearing for the air permit was held December 12, 2002 and it is expected that the Environmental Protection Agency will confirm ADEQ's decision to grant the air permit in February 2003 after their technical review. The Cochise County Planning and Zoning

Commission approved a Special Use Permit for the Bowie site on September 11, 2002 and Cochise County Board of Supervisors unanimously approved the rezoning of the Bowie site to Heavy Industrial on September 24, 2002. Submittal of the 404 Application for both the lateral natural gas pipeline and transmission line to the U.S. Army Corps of Engineers is anticipated in February 2003.

After final approval of all applicable permits, construction will commence on the first 500 MW block phase in the 3rd quarter of 2003 and the second 500 MW block phase in the 3rd quarter of 2005. Following construction of each power block phase and synchronization of the turbines, Bowie anticipates commencing in-service commercial operation for the power station in the following time sequence:

Phase 1	4th quarter 2005
Phase 2	4th quarter 2007

The anticipated commercial in-service operation for the 345 kV and 230 kV transmission facilities associated with the power station will be no later than 4th quarter 2005.

4. The average and maximum power output measured in megawatts of each plant installed.

Bowie Power Station, LLC proposes to construct and operate a nominal 1,050-megawatt (MW) combined-cycle combustion turbine facility (50 MW for duct-firing). As noted above, this duct-firing feature was authorized in Decision No. 64625. Generally, Bowie will be operated to provide its maximum electrical output during the summer and winter peak periods when the demand for the electricity is highest. The combustion turbines may be shut down or operated at partial loads when the market demand for electricity will not support the full production of the generating facility.

5. The expected capacity factor for each proposed plant.

Bowie Power Station, LLC will be designed for base--load combined cycle operations with supplemental fired peaking capability and can be operated at any given time 24 hours per day, 7days per week, 52 weeks per year. The facility is expected to have a capacity factor of 85% that will be determined by market factors, such a growth in energy demands and daily wholesale energy prices.

6. The type of fuel to be used for each proposed plant.

The source of natural gas supply for Bowie Power Station, LLC will be the El Paso Natural Gas (EPNG) system and will likely be from Line No. 2000 (All American Pipeline) located south of the site. The tap will be located approximately 4&1/2 miles from the facility metering point.

To date 230,000 MCF/day is flowing through Line 2000 with another 320,000 being added in 2004. Discussions on a fuel acquisition program and the lateral connection of the pipeline have commenced between EPNG and Bowie's engineering consultant.

7. The plans' for any new facilities shall include a power flow and stability analysis report showing the effect on the current Arizona electric transmission system. Transmission owners shall provide the technical reports, analysis or basis for projects that are included for serving customer load growth in their service territories.

In connection with the proposed transmission project of the Bowie Power Station, we are attaching (Attachment B) the Interconnection System Impact Study (revised December 4, 2002) completed in cooperation with the Tucson Electric Power Company (TEP). This report is under discussion with TEP and possibly may be further modified in the future in these discussions.

In the event you have any questions regarding the above and the attached report or would like additional information, please feel free to contact Dr. Gary Crane or myself at (602) 808-2004.

Sincerely,

Tom Wray

Tom Wray
General Manager

Cc:
File
Ernest Johnson w attachments (Utility Director)
Jerry Smith w attachments (Utility Engineer)
Gary Crane w/o attachments (SWPG)
Laurie Woodall w/o attachments (Chairman, Siting Committee)
Larry Robertson w/o attachments (Munger Chadwick, PLC)

ATTACHMENTS

Attachment "A"

40-360.02. Plans; filing; failure to comply; classification

A. Every person contemplating construction of any transmission line within the state during any ten year period shall file a ten year plan with the commission on or before January 31 of each year.

B. Every person contemplating construction of any plant within the state shall file a plan with the commission ninety days before filing an application for a certificate of environmental compatibility as provided in section 40-360.03.

C. Each plan filed pursuant to subsection A or B of this section shall set forth the following information with respect to the proposed facilities to the extent such information is available:

1. The size and proposed route of any transmission lines or location of each plant proposed to be constructed.

2. The purpose to be served by each proposed transmission line or plant.

3. The estimated date by which each transmission line or plant will be in operation.

4. The average and maximum power output measured in megawatts of each plant to be installed.

5. The expected capacity factor for each proposed plant.

6. The type of fuel to be used for each proposed plant.

7. The plans for any new facilities shall include a power flow and stability analysis report showing the effect on the current Arizona electric transmission system. Transmission owners shall provide the technical reports, analysis or basis for projects that are included for serving customer load growth in their service territories.

D. The information in the plan reported to the commission in subsection B of this section is not open to public inspection and shall not be made public if disclosure of the information in the plan could give a material advantage to competitors. The information in the plan protected as confidential under subsection B of this section is any information that is similar to the information that would be confidential under section 40-204. An officer or employee of the commission who knowingly divulges information in the plan in violation of this subsection is guilty of a class 2 misdemeanor.

E. Failure of any person to comply with the requirements of subsection A, B or C of this section may, in the commission's discretion in the absence of a showing of good cause, constitute a ground for refusing to consider an application of such person.

F. The plans shall be recognized and utilized as tentative information only and are subject to change at any time at the discretion of the person filing the plans.

G. The plans shall be reviewed biennially by the commission and the commission shall issue a written decision regarding the adequacy of the existing and planned transmission facilities in this state to meet the present and future energy needs of this state in a reliable manner.

Attachment "B"

BOWIE POWER PARTNERSHIP
BOWIE POWER PROJECT

INTERCONNECTION STUDY

SYSTEM IMPACT STUDY

Revised
December 4, 2002

Tucson Electric Power
A UniSource Energy Company

Prepared by
Jorge Chacon
(Utility System Efficiencies)

Tucson Electric Power Company

Ed Bec

EXECUTIVE SUMMARY

Tucson Electric Power Company (TEP) performed a system impact study as requested by Bowie Power Partnership for interconnection of a new generation plant with a total net capacity of 528MW. A new proposed substation, Willow 345-kV, is to be built approximately 40 miles south of the existing Greenlee 345-kV substation. The Willow 345-kV substation will loop the Greenlee-Winchester 345-kV line (portion of the existing Greenlee-Vail 345-kV line). Service to the proposed Bowie Power Project will be provided by one bundled-954 ACSR, 14½ mile, 345-kV radial transmission line out of the proposed Willow 345-kV substation. A second radial 345-kV transmission line to the Willow substation may be constructed in the future if such line is determined to be required. The proposed in-service date for the project is June 1, 2005.

The purpose of this System Impact Study is to determine the adequacy of the local Extra High Voltage (EHV) Transmission system to accommodate interconnection of all or part of the 528MW of proposed new generation. The study will include all projects in queue ahead of this request regardless of the proposed in-service dates. The study will focus mainly on the electric transmission systems of APS, SRP, SWTC (formerly known as AEPCO), TEP and WAPA. This study will identify if there are any negative impacts to reliability under various power displacement scenarios and determine if sufficient capacity exists without system expansion beyond the assumed integration plan. In addition, a sensitivity study was also performed to identify adequacy of Arizona's EHV Transmission system without inclusion of the Springerville units 3 and 4 power project. All other projects in queue ahead of this request were added to the sensitivity study cases.

The results of this system impact study will be used in the future Facility and Transmission Service Request studies as the basis to determine the required transmission facility upgrades resulting from the addition of the project and the project's cost allocation for those facility upgrades. The Transmission Service Request studies should evaluate timing of such required facilities taking into account the proposed in-service dates for those projects included in the System Impact study but with an in-service date after the proposed Bowie Power Project. ***The study accuracy and the results for the assessment of the system adequacy are contingent on the accuracy of the technical data provided by the customer as shown in Figures 1 and 2 and Appendix K.*** Any changes to the attached data could invalidate the study results.

The study was performed for various 2005 Heavy Summer generation dispatch scenarios.

(a) No Bowie Power Project
(b) Power displaced in APS and SRP systems (50/50 split)
(c) Power displaced throughout Arizona (existing generation scaled down)
(d) Load increased throughout Arizona (major heat wave assumption)

The study includes a steady-state power flow analysis, post-transient voltage analysis, and transient stability analysis. Short-circuit duty analysis will be performed as part of the Facilities Study.

In addition, TEP has done an internal study of Two County flow issues and the effect of Bowie generation on Reliability Must Run generation, for a single load level. Full impact of Bowie generation on operating characteristics of TEP's system would need to be determined in detailed, comprehensive operating studies of multiple loads and system conditions.

CONCLUSIONS

Since market dispatch conditions are unknown ahead of scheduling, the 2005 heavy summer set of conditions analyzed provide scenarios for testing the Bowie Power Project impacts under conditions that credibly represent potential market conditions for integrating additional market generation. These conditions are snapshots of a simultaneous use limit that does not envelop all possible combinations. Efforts were made to try and capture worst possibilities that may result under the given Path 22 and Path 50 power flows modeled.

Studies identified that the existing and planned facilities (2005) are adequate to provide service to the proposed Bowie Power Project under normal conditions with facilities in service.

The study has identified additional need for physical upgrades to mitigate overloads resulting from four single and four double outage conditions. It should be noted that the power flow cases did not represent maximum Southwest of Four Corners (Path 22) and maximum Cholla-Pinnacle Peak (Path 50) power flows. The following line and transformer bank overloads are seen with the Bowie Power Project at maximum output under the scenarios evaluated:

1. Outage of the Coronado-Silverking 500-kV transmission line results in overloading the Cholla 500/345-kV No.1 and No.2 transformer banks. Pre-Project loading was identified at 89% and 91% respectively with post-project loading identified to be at 104% and 105% respectively. No emergency capability is listed in the GE datasets. Sensitivity studies performed without the addition of the Springerville Unit 3 & 4 expansion project demonstrated that these overloads would not occur under such scenario.

2. Outage of the Springerville-Luna 345-kV transmission line results in overloading the Hidalgo-Greenlee 345-kV transmission line. Pre-project loading was identified to be at 99% and post-project loading was identified to be at 102%. No emergency capability is listed in the GE datasets.

3. Outage of the Knox-Santa Rosa 230-kV transmission line results in overloading the Santa Rosa 230/115-kV transformer bank. Pre-project loading was identified to be at 129% and post-project loading was identified to be at 136%. The overload is an existing overload triggered by a project in queue ahead of the Bowie Power Project request, which is aggravated by the addition of the Bowie Power Project. Remedial Action Schemes or facility upgrades that may be in place to mitigate this overload should be reviewed to ensure no additional upgrades are required as a result of the Bowie Power Project.

4. Outage of the Saguaro West-Empire 115-kV transmission line results in overloading the Santa Rosa 230/115-kV transformer bank. Pre-project loading was identified to be at 106% and post-project loading was identified to be at 109%. As mentioned above, the

overload is an existing overload, which is aggravated by the addition of the Bowie Power Project.

5. Simultaneous outage of the Cholla-Saguaro 500-kV and Coronado-Silverking 500-kV transmission lines results in overloading transformer banks and transmission lines as summarized below:

    - Loading on the Cholla 500/345-kV No.1 transformer bank is aggravated (increased from 134% up to 147%) with the addition of the Bowie Power Project. This is an existing overload that is limited to the bank normal rating since no emergency rating is defined to be available in the GE datasets.

    - Loading on the Cholla 500/345-kV No.2 transformer bank is aggravated (increased from 137% up to 150%) with the addition of the Bowie Power Project. This is an existing overload that is limited to the bank normal rating since no emergency rating is defined to be available in the GE datasets.

    - Loading on the Cholla-Preacher Canyon 345-kV transmission line is aggravated (increased from 131% up to 140%) with the addition of the Bowie Power Project. Emergency capability on this line is limited to no more than 130%.

    - Loading on the Cholla-Pinnacle Peak 345-kV transmission line is increased beyond the emergency capability of 130% with the addition of the Bowie Power Project. Pre-project loading was identified to be 127% while post-project loading increased to 136%.

    - Loading on the Preacher Canyon-Pinnacle Peak 345-kV transmission line is increased beyond the emergency capability of 130% with the addition of the Bowie Power Project. Pre-project loading was identified to be 123% while post-project loading increased to 132%.

    - Loading on the Cholla-Leupp 230-kV transmission line is increased beyond the allowable limit of 100% with the addition of the Bowie Power Project. No emergency capability is identified to be available in the GE datasets. Pre-project loading was identified to be 96% while post-project loading increased to 104%.

    - Loading on the Leupp-Coconino 230-kV transmission line is increased beyond the allowable limit of 100% with the addition of the Bowie Power Project. No emergency capability is identified to be available in the GE datasets. Pre-project loading was identified to be 95% while post-project loading increased to 103%.

Sensitivity studies performed without the addition of the Springerville Unit 3 & 4 expansion project demonstrated that only the overloads on the Cholla 500/345-kV No.1 and No.2 transformer banks would remain under such scenario.

6. Simultaneous outage of the Cholla-Pinnacle Peak 345-kV and Cholla-Preacher Canyon 345-kV transmission lines results in overloading the Pinnacle Peak (APS)-Pinnacle Peak (WAPA) 230-kV transmission line. Pre-project loading was identified to be at 115% and post-project loading was identified to be up to 132%. The overload is an existing overload that is aggravated by the addition of the Bowie Power Project. Remedial Action Schemes that may be in place to mitigate this overload should be reviewed to ensure no additional action is required as a result of the Bowie Power Project.

7. Simultaneous outage of the Cholla-Pinnacle Peak 345-kV and Preacher Canyon-Pinnacle Peak 345-kV transmission lines results in overloading the Pinnacle Peak (APS)-Pinnacle Peak (WAPA) 230-kV transmission line. Pre-project loading was identified to be at 113% and post-project loading was identified to be up to 130%. The overload is an existing overload that is aggravated by the addition of the Bowie Power Project. Remedial Action Schemes that may be in place to mitigate this overload should be reviewed to ensure no additional action is required on behalf of the Bowie Power Project.

8. Simultaneous outage of the Springerville-Vail2 345-kV and Winchester-Vail 345-kV transmission lines results in overloading the Bicknell 345/230-kV transformer bank beyond the allowable emergency rating. This is an existing overload that is aggravated with the addition of the Bowie Power Project. Bowie Power Project will be required to participate in mitigation measures such as generation tripping in order to mitigate contributions associated with the Bowie Power Project. A second transformer bank should be explored as an option to mitigate existing overload as well as Bowie Power Project contribution that is presently dealt with by implementation of an Operating Procedure. The Operating Procedure does not appear to be sufficient after the addition of the Bowie Power Project.

No system transient stability or post-transient voltage problems were identified with the addition of the Bowie Power Project. However, the Bowie Power Project may be subject to scheduling limitations not identified in this report to ensure that the transmission path flows stay within thermal and/or operational limits. Operational studies should be conducted to identify if the Bowie Power Project adversely impacts Path 22 and Path 50.

A Facility Study will be needed to determine the interconnection facilities and system upgrades required to interconnect the Bowie Power Project consistent with FERC protocols and policies. The study should address the following scope:

1. Determine the interconnection facilities and cost required to integrate the Bowie Power Project to the existing system. These facilities should include:

    a. proposed Willow 345-kV switchyard facilities, circuit breakers, relay protection, communication and metering

b. proposed short line extensions required to loop existing Winchester-Greenlee 345kV transmission line into the proposed Willow 345/230-kV substation
c. one (potential for two) 14.5 mile 2B-954 ACSR 345-kV radial line(s) from the proposed Willow 345-kV substation required to serve the proposed Bowie substation
d. proposed Bowie switchyard facilities, circuit breakers, relay protection, and metering
e. necessary communication requirements to the proposed Bowie substation
f. additional direct connect facilities and mitigations not identified above such as possible land acquisition, environmental impact mitigation, etc.

2. Determine facility upgrades required to maintain existing system reliability. This will include the following:

    a. complete short-circuit duty engineering review of all breakers located in the TEP transmission system.
    b. complete evaluation of existing remedial action schemes to ensure that the schemes are still adequate after the addition of the Bowie Power Project

A Transmission Service Request Study will be needed to determine the transmission facilities and system upgrades required to transmit Bowie Power Project energy throughout the State of Arizona consistent with FERC protocols and policies. The study should address the following scope:

1. Determine facility upgrades and cost requirements necessary to mitigate single contingency overloads identified on the following:

    a. Cholla 500/345-kV No.1 Transformer Bank
    b. Cholla 500/345-kV No.2 Transformer Bank
    c. Hidalgo-Greenlee 345-kV Transmission Line
    d. Santa Rosa 230/115-kV Transformer Bank

2. Determine if congestion management is a feasible alternative or identify facility upgrades and/or mitigation measures and cost requirements needed to mitigate double contingency overloads identified on the following:

    a. Cholla 500/345-kV No.1 Transformer Bank
    b. Cholla 500/345-kV No.2 Transformer Bank
    c. Cholla-Pinnacle Peak 345-kV Transmission Line (increased from 127% up to 136%)
    d. Cholla-Preacher Cyn 345-kV Transmission Line (increased from 131% up to 140%)
    e. Cholla-Leupp 230-kV Transmission Line (increased from 96% up to 104%)
    f. Leupp-Coconino 230-kV Transmission Line (increased from 95% up to 103%)
    g. Pinnacle Peak (APS)-Pinnacle Peak (WAPA) 230-kV Transmission Line (increased from 115% up to 117%)
    h. Preacher Cyn-Pinnacle Peak 345-kV Transmission Line (increased from 123% up to 132%)
    i. Bicknell 345/230-kV Transformer Bank

3. Evaluate operating procedures ("Two-County Rule") that may be impacted with the addition of the project.

4. Identify new operating procedures that will be required for those facilities where congestion protocols were implemented in lieu of facility upgrades. Actual operating procedures and studies to support those procedures will not be developed until the Facility Interconnection and Operation Agreement ("FIOA") is executed. Any operating procedure change or additional new operating procedure will require TEP and other impacted utilities' review and approval. These approvals will be obtained after FIOA execution, and prior to service connection for testing and operation.

CONTENTS

FIGURES

BOWIE POWER PROJECT
INTERCONNCETION STUDY

SYSTEM IMPACT STUDY

September 5, 2002

INTRODUCTION

Tucson Electric Power Company (TEP) performed a system impact study as requested by Bowie Power Partnership for interconnection of a new generation plant with a total net capacity of 528MW. A new proposed substation, Willow 345-kV, is to be built approximately 40 miles south of the existing Greenlee 345-kV substation. The Willow 345-kV substation will loop the Greenlee-Winchester 345-kV line (portion of the existing Greenlee-Vail 345-kV line). Service to the proposed Bowie Power Project will be provided by one bundled-954 ACSR, 14½ mile, 345-kV radial transmission line out of the proposed Willow 345-kV substation. A second radial 345-kV transmission line to the Willow substation may be constructed in the future if such line is determined to be required. The proposed in-service date for the project is June 1, 2005.

The purpose of this System Impact Study is to determine the adequacy of the local Extra High Voltage (EHV) Transmission system to accommodate interconnection of all or part of the 528MW of proposed new generation. The study will include all projects in queue ahead of this request regardless of the proposed in-service dates. The study will focus mainly on the electric transmission systems of APS, SRP, SWTC (formerly known as AEP), TEP and WAPA. This study will identify if there are any negative impacts to reliability under various power displacement scenarios and determine if sufficient capacity exists without system expansion beyond the assumed integration plan. In addition, a sensitivity study was also performed to identify adequacy of Arizona's EHV Transmission system without inclusion of the Springerville units 3 and 4 power project. All other projects in queue ahead of this request were added to the sensitivity study cases.

The results of this system impact study will be used in the future Facility and Transmission Service Request studies as the basis to determine the required transmission facility upgrades resulting from the addition of the project and the project's cost allocation for those facility upgrades. The Transmission Service Request studies should evaluate timing of such required facilities taking into account the proposed in-service dates for those projects included in the System Impact study but with an in-service date after the proposed Bowie Power Project. ***The study accuracy and the results for the assessment of the system adequacy are contingent on the accuracy of the technical data provided by the customer as shown in Figure 1 and 2 and Appendix K.*** Any changes to the attached data could invalidate the study results.

The study was performed for various 2005 Heavy Summer generation dispatch scenarios.

(a) No Bowie Power Project
(b) Power displaced in APS and SRP (50/50 split)

(c) Power displaced throughout Arizona (existing generation scaled down)
(d) Load increased throughout Arizona (major heat wave assumption)

The following sections provide detailed study conditions and assumptions and present the results of Steady-state power flow, Post-transient voltage, and Stability assessments.

STUDY CONDITIONS AND ASSUMPTIONS

A. Planning Criteria

The study was conducted by applying the Western Electric Coordinating Council (WECC) Reliability Criteria. More specifically, the main criteria applicable to this study are as follows:

Load Flow Assessment

The following contingencies are considered for transmission or subtransmission lines and 500/345-kV, 500/230-kV, and 345/230-kV transformer banks:

- Single Transmission Line Contingencies (115-kV and above)
- Single Transformer Contingencies (500-kV, 345-kV, and 230-kV Banks)
- Double Transmission Line Contingencies (Common Mode)
- Single Line and Single Transformer Bank (Common Mode)
  (Outages of two transformer banks are beyond the Planning Criteria)

Stability Assessment

The Transmission System is to remain stable under a three-phase-to-ground fault at the most critical locations, normally cleared, with the loss of one or two transmission lines. The system is also to remain stable under the most critical single-phase-to-ground fault with delayed clearing. Maximum acceptable first swing voltage drops are 25% under single contingencies and 30% under double contingencies. In addition, first swing voltage swings are not to exceed 20% for more than 20 cycles under single contingency and no more than 20% for 40 cycles under double contingency conditions as defined by the WECC Planning Criteria.

Post Transient Voltage Assessment

The maximum voltage deviations allowed under contingency conditions in the post transient time frame are:

- 5 percent under N-1 (one generator, one circuit, or one transformer)
- 10 percent under N-2 (two generators or two circuits)

B. Congestion Management

The following principles were used in determining whether congestion management, remedial action schemes, or facility upgrades are required to mitigate base case, single contingency, or double contingency overloads.

- Congestion management, as means to mitigate base case overloads, can be used if it is determined that the overloads are minimal (less than 5% of the facility normal rating) and impacted utilities concur with the use of congestion management.
- Facility upgrades will be required if it is determined that the use of congestion management is not practical (loading exceeds long-term emergency ratings).
- Facility upgrades will be required to mitigate single contingency overloads if it is determined that the use of remedial action schemes (RAS) are not allowed.
- RAS, in lieu of facility upgrades, will be recommended for double contingencies if the scheme is effective and does not jeopardize system reliability. Such determination will be based on outage of a single Palo Verde unit.
- Facility upgrades will be recommended if RAS is determined to be unworkable or if it is determined to jeopardize system reliability.

The following study method was implemented to assess the extent of possible congestion:

a). Under Base Case (all transmission facilities in service), without the proposed Bowie Power Project, the system was evaluated with all existing interconnected generation and all known generation requests in the area that have a queue position ahead of this project. The following projects were modeled in the pre-project case with the corresponding generation dispatch:

Project Name	Project Dispatch
1. Arlington Valley	600
2. Desert Basin Generation	510
3. Gila River	500
4. Harquahala	600
5. Kyrene Expansion (Units 7CT & 7ST)	260
6. Mesquite	500
7. Red Hawk	490
8. Springerville Units 3 & 4	860
9. Santan	420
10. Sundance Power Project	420
11. West Phoenix	315

It should be noted that these dispatch patterns do not reflect the maximum output available from the corresponding generation projects but rather an "expected" potential scenario that was assumed for the purposes of performing the Bowie System Impact Study.

b). Under Base Case, the total output of the proposed Bowie Power Project was added and the system was reevaluated. Generation patterns were re-dispatched to allow full output of the proposed Bowie Power Project.

If the normal loading limits of facilities are exceeded in (a), the overload is identified as an existing overload or an overload caused by a project or number of projects in the queue ahead of the proposed project. If the normal loading limits of facilities are exceeded in (b) but were not identified in (a), the overload is identified as having been caused by the addition of the proposed project. Special attention is required for the load increase scenario to ensure that overloads identified are triggered by the proposed Bowie Power Project and not by the load increase itself.

The Bowie Power Project and other projects in the queue ahead of this request may be subjected to congestion management, potential upgrade cost sharing and/or participation in any proposed remedial action schemes if the project aggravates or triggers the overload. Additionally, Bowie Power Project may have to participate in mitigation of overloads triggered by subsequent projects in the queue, subject to FERC protocols and policies.

In order for congestion management to be feasible, the following three factors need to be satisfied:

- **Sufficient Time** – Transmission line overloads must be within the long-term emergency rating in order to allow sufficient time required for necessary generation re-dispatch coordination and communication between the utility operators and scheduling coordinators. This factor may be mitigated if generation dispatch is determined on a day-ahead basis and not on a "real-time" basis.

- **Generation/Impact Relationship** – A distinct relationship needs to be established between the generation and the impacted facility. This requirement is necessary so that proper operating procedures can be developed by the impacted utilities in order to manage the system either in real-time or day-ahead scheduling.

- **Manageable Generation Resources**– Generation resources contributing to the overload must be "dispatchable". The dispatch schedule needs to be known and the resource must be capable of being controlled (i.e. no wind generation or other generation resources that result in "as available" generation). This requirement is necessary so that the system does not experience generation ramping up and ramping down.

The results of these studies should be able to identify:

a). If there is capacity available to accommodate the proposed project and all projects in the queue without the need for congestion management, remedial action schemes or facility upgrades.

b). All impacted facilities in the area.

c). If congestion exists in the area with all projects in the queue under single element and double element outage conditions assuming no new remedial action schemes in place.

d). If remedial action schemes appear to be workable solutions to increasing the amount of generation that can be accommodated prior to a potential double element outage condition.

C. Bowie Power Partnership – Bowie Power Project

Figure 2 shows the one-line diagram of the proposed Bowie Power Project interconnection. A summary of the total plant output is as follows:

Proposed Bowie Power Project

Two 2x1 Combined-Cycle Units	
2 Gas Units (G1-G2)	155 MW (each)
1 Steam Unit (ST)	230 MW (each)
Auxiliary Loads	12 MW
Phase One Plant Output	528 MW

The proposed project's 345-kV substation (Willow) bus will be interconnected to the proposed Willow 345-kV bus by two 345-kV transmission lines. The proposed Willow 345-kV bus will be interconnected to the Greenlee-Winchester (section of the existing Greenlee-Vail 345-kV transmission lines) by looping the line into Willow. Figure 1 illustrates this proposed interconnection.

The dynamic data using GE PSLF models was provided by the client and is included in Appendix K.

D. Power Flow Study

Maximum generation modeled within Arizona exceeds the total Arizona area load prior to the addition of the Bowie Power Project. Generation in excess of the Arizona load will therefore be competing for available export capacity to California, New Mexico, and Nevada. Under heavy summer conditions, the "No Bowie" modeled base case is assumed to have a total Arizona load of 14,904 MW with a corresponding generation output of 19,646 MW and an export of 4,528 MW. Approximately 5,000 MW of new proposed projects in the Palo Verde area were assumed to be off-line for this assessment as a result of export limitations.

As a result, the Bowie Power Project will be either competing for available capacity to serve the Arizona load or competing for available export capacity to wheel power to markets outside of Arizona. Since market generation dispatch conditions are not known in advance, three scenarios were developed to cover realistic potential generation dispatch schedules. These three scenarios looked at Bowie displacing generation in APS and SRP service areas (50/50 split), spreading the generation displacement throughout the state, and increasing overall Arizona system loads so that the generation project can be accommodated to serve the load.

To simulate the Arizona Extra High Voltage (EHV) transmission system for analysis, the study used a WSCC 2005 heavy summer database modified by APS, WAPA, and TEP to reflect more current information. Heavy summer load forecasts are shown in Table 1-1 through 1-5. The following scenarios were considered:

(a) No Bowie Power Project
(b) Power displaced in APS and SRP service areas (50/50 split)
(c) Power displaced throughout Arizona (generation scaled down throughout Arizona)
(d) Load increased throughout Arizona

Load flow studies were conducted under 2005 heavy summer conditions. Further description of the case assumptions follows:

a). Case 1 - 2005 Heavy Summer without the Bowie Power Project and the following path flows:

- 5,703 MW East-of-River (EOR)
- 6,447 MW West-of-River (WOR)
- 1,647 MW Southwest of Four Corners (Path 22 rated at 2325 MW)
- 961 MW Cholla-Pinnacle Peak (Path 50 rated at 1200 MW)

It should be noted that Path 22 and Path 50 are not dispatched at the maximum allowable levels prior to the addition of the Bowie Power Project. Additional review should be performed by APS and SRP to identify if the Bowie Power Project adversely impacts WECC established path ratings.

b). Case 2 - 2005 Heavy Summer with the Bowie Power Project displacing APS/SRP area generation (50/50 split) and the following path flows:

- 5,681 MW East-of-River (EOR)
- 6,429 MW West-of-River (WOR)
- 1,707 MW Southwest of Four Corners (Path 22 rated at 2325 MW)
- 1,030 MW Cholla-Pinnacle Peak (Path 50 rated at 1200 MW)

The addition of the Bowie Power Project is shown to increase Path 22 and Path 50 power flows and therefore would impact WECC established path rating if pre-project cases were dispatched at maximum path flows as suggested above in Case 1. The Bowie Power Project will be required to dispatch in accordance with the pre-established path ratings.

c). Case 3 - 2005 Heavy Summer with the Bowie Power Project displacing entire Arizona area generation (pro-rata) and the following path flows:

- 5,703 MW East-of-River (EOR)
- 6,437 MW West-of-River (WOR)
- 1,671 MW Southwest of Four Corners (Path 22 rated at 2325 MW)
- 1,003 MW Cholla-Pinnacle Peak (Path 50 rated at 1200 MW)

The addition of the Bowie Power Project is shown to increase Path 22 and Path 50 power flows and therefore would impact WECC established path rating if pre-project cases were dispatched at maximum path flows as suggested above in Case 1. The Bowie Power Project will be required to dispatch in accordance with the pre-established path ratings.

d). Case 4 - 2005 Heavy Summer with increased Arizona area system load to allow full dispatch of the Bowie Power Project and the following path flows:

- 5,717 MW East-of-River (EOR)
- 6,436 MW West-of-River (WOR)
- 1,699 MW Southwest of Four Corners (Path 22 rated at 2325 MW)
- 1,023 MW Cholla-Pinnacle Peak (Path 50 rated at 1200 MW)

The addition of the Bowie Power Project is shown to increase Path 22 and Path 50 power flows and therefore would impact WECC established path rating if pre-project cases were dispatched at maximum path flows as suggested above in Case 1. The Bowie Power Project will be required to dispatch in accordance with the pre-established path ratings.

2003 HEAVY SUMMER CONDITIONS ARIZONA AREA TOTAL GENERATION, IMPORT, LOAD AND LOSSES (MW)				
	Case 1	Case 2	Case 3	Case 4
EOR	5,703	5,681	5,703	5,717
WOR	6,447	6,429	6,437	6,436
PATH 22	1,647	1,707	1,671	1,699
PATH 50	961	1,030	1,003	1,023
Gen	19,646	19,650	19,611	20,191
Export	4,528	4,528	4,528	4,528
Load	14,784	14,784	14,784	15,312
Losses	369	372	334	388

The table above identifies the Arizona area system demand and resources modeled for the 2005 Heavy Summer cases studied.

Simulations

For each of the four cases, load flow simulations of the bulk power system were conducted for the base case, single contingencies and double contingencies for lines and transformer banks to determine impacts to the Arizona EHV system. A total of 224 single contingencies and 22 common mode double contingencies within the Arizona EHV system were studied with system performance monitored for planning criteria violations on the Arizona 500-kV, 345-kV, 230-kV, 138-kV, and 115-kV systems. .

E. **Transient Stability Study**

Stability studies were conducted for the following NERC category "B' and "C" contingencies. Category "B" contingencies simulated are as follows:

1. A four-cycle three-phase fault on the proposed Willow 345-kV bus followed by loss of the Greenlee-Willow 345-kV line.

2. A four-cycle three-phase fault on the proposed Willow 345-kV bus followed by loss of the Winchester-Willow 345-kV line.

3. A four-cycle three-phase fault on the Greenlee 345-kV bus followed by loss of the Greenlee-Greenlee (AEP) 345-kV line.

4. A four-cycle three-phase fault on the Springerville 345-kV bus followed by loss of the Springerville-Greenlee 345-kV line.

5. A four-cycle three-phase fault on the Springerville 345-kV bus followed by loss of the Vail-Springerville 345-kV line.

6. A four-cycle three-phase fault on the Springerville 345-kV bus followed by loss of the Springerville-Coronado 345-kV line.

7. A four-cycle three-phase fault on the Springerville 345-kV bus followed by loss of the Springerville-McKinley 345-kV line.

8. A four-cycle three-phase fault on the Springerville 345-kV bus followed by loss of the Springerville-Luna 345-kV line.

9. A four-cycle three-phase fault on the Vail 345-kV bus followed by loss of the Vail-South 345-kV line.

10. A four-cycle three-phase fault on the Coronado 500-kV bus followed by loss of the Cholla-Coronado 500-kV line.

11. A four-cycle three-phase fault on the Coronado 500-kV bus followed by loss of the Coronado-Silverking 500-kV line.

Category "C" contingencies simulated are as follows

12. A four-cycle three-phase fault on the Springerville 345-kV bus followed by simultaneous loss of the Springerville-Vail 345-kV and Springerville-Greenlee 345-kV lines.

13. A four-cycle three-phase fault on the Springerville 345-kV bus followed by simultaneous loss of both Springerville-McKinley 345-kV lines.

14. A four-cycle three-phase fault on the Vail 345-kV bus followed by simultaneous loss of the Springerville-Vail 345-kV and Vail-Winchester 345-kV lines.

15. A four-cycle three-phase fault on the Coronado 500-kV bus followed by simultaneous loss of the Cholla-Coronado and Coronado-Silverking 500-kV lines.

16. A four-cycle three-phase fault on the Willow 345-kV bus followed by simultaneous loss of the Springerville-Vail 345-kV and Greenlee-Willow 345-kV lines.

These sixteen contingencies have been identified to be the most critical cases for stability analysis of the proposed Bowie Power Project. Switch decks were developed to simulate each complete contingency. Each contingency run contains a one second pre-disturbance, a four-cycle faulted condition simulated by faulting a bus, flashing series capacitor banks where appropriate, clearing the line and re-inserting the series capacitor bank. Although series capacitor flash-over will only occur as a result of increase in voltage or increased currents and is highly dependant on the short-circuit duty current, the simulations assumed the capacitors would flash in order to simulate the worst case scenario. The same Bowie Power Project cases used for power flow studies were also used for the stability study. Dynamic stability data provided is included in Appendix K.

F. <u>Post Transient Voltage Study</u>

The power flow study voltage results were used as a screen to identify those contingencies that may require additional post transient voltage studies. Contingencies identified in the power flow to have a voltage drop in excess of 5% where the Bowie Power Project either triggers or aggravates the voltage drop for single and double contingencies were selected for post-transient simulation.

G. <u>Short Circuit Duty Study</u>

To determine the impact of the Bowie Power Project on short circuit duties at buses located within the SWTC and TEP systems, the study calculated the maximum symmetrical three-phase and single-phase-to-ground short circuit duties at critical buses.

H. Reliability Must Run Generation

RMR generation is determined in operating studies for all feasible operating and initially-out-of-service conditions on the TEP system. The The Arizona Corporation Commission has mandated that Arizona utilities determine means of lowering RMR requirements. In addition, local generation (which is the generating units used for RMR) is more expensive than remote generation, and there would be substantial cost to TEP if RMR went up due to Bowie.

For the above reason, the Bowie internal study was done with the RMR generation needed for the pre-Bowie TEP system to meet WECC/NERC and TEP internal criteria. The pre-Bowie system included the Winchester interconnection and the Gateway project.

TEP INTERNAL CRITERIA

The TEP internal criteria for WECC/NERC outage levels B and C are identical to the WECC/NERC criteria, with the addition of a voltage criterion: post-outage average 138kV voltages must be between .98 per unit and 1.05 per unit. The TEP internal level D criterion is more stringent than the WECC/NERC level D criterion, in that a two-element level D outage must meet internal level C criteria but only must meet WECC/NERC level D criteria in other systems. Therefore, overloads or an element trip due to overload on other systems can occur due to a two-element level D outage, but not on TEP's system. Two-element level D outages must not result in voltage collapse or thermal overload on TEP's own system.

TEP'S TIE OPEN LOAD SHED REMEDIAL ACTION SCHEME

TEP utilizes an automated remedial action scheme to react to system outages; for single outages (WECC/NERC level B,) three different reactive devices can be automatically switched, depending on system conditions. For multiple outages (WECC/NERC levels C and D,) direct load tripping can be utilized, in addition to or instead of the reactive device switching.

Both the reactive device switching and the direct load tripping are pre-determined in operating studies. Up to one third of the existing load can be directly tripped, at pre-determined locations and in pre-determined amounts. The reactive devices are individually selectable by outage, as is the direct load trip amount.

I. Two-County Bond Criteria

Due to Two-County Industrial Development Bond restrictions, all TEP tie points must have power flowing into Tucson on an instantaneous (not net) basis, and the flow on the Springerville-Vail transmission line must be greater than the output of Springerville Unit #2. These conditions must be met at all times except during conditions of Emergency Compliance.

J. **Sensitivity Studies - Without Springerville Units 3 & 4**

At the request of Bowie Power Partnership, sensitivity studies were performed to evaluate the impacts of the Bowie Power Project assuming that the Springerville Unit 3 & 4 power project is not dispatched. Complete power flow, transient stability, and post-transient voltage studies were performed for this sensitivity analysis. It should be noted that the sensitivity studies are for information purposes only and that they do not substitute results identified in the System Impact Study performed.

STUDY RESULTS

A. **Power Flow Study**

Power flow studies performed for the various scenarios identified a number of transmission facilities that are adversely impacted by the addition of the Bowie Power Project. Tables 2-1 through 2-3 summarize the power flow study results for the System Impact Study.

Below is a detailed description of each facility impacted and potential system mitigation that should be addressed by the corresponding utility owner in either the Facilities Study or Transmission Service Request Study:

Single Contingency Study Results

1) Coronado-Silverking 500-kV Transmission Line outage

With the addition of the Bowie Power Project, the study identified that outage of the Coronado-Silverking 500-kV transmission line results in overloading the Cholla 500/345-kV No.1 and No.2 transformer banks. Mitigation measures may require installation of a third 500/345-kV transformer bank at Cholla.

2) Springerville-Luna 345-kV Transmission Line outage

With the addition of the Bowie Power Project, the study identified that outage of the Springerville-Luna 345-kV transmission line results in overloading the Hidalgo-Greenlee 345-kV transmission line. Line loading is increased from 100% pre-project to 102% after the addition of the project under this outage condition. The GE data sets do not show emergency capability on this transmission line. This transmission line should be evaluated in order to identify if emergency capacity is available. If no emergency capacity is identified to be available, congestion management may be implemented as a mitigation measure since the overload is minimal.

3) Knox-Santa Rosa 230-kV Transmission Line outage

The study identified that outage of the Knox-Santa Rosa 230-kV transmission line results in loading the Santa Rosa 230/115-kV transformer bank in excess of the

167MVA rating prior to the addition of the Bowie Power Project. This overload is attributed to the addition of the Desert Basin Generation. No emergency capability is identified to be available for this transformer bank in the GE Datasets.

With the addition of the Bowie Power Project, the existing single contingency overloads identified was found to be aggravated. Overloads are increased from 129% up to 136%. The transformer bank ratings should be evaluated to identify if emergency capacity is available. If no emergency capacity is identified to be available, a remedial action scheme should be in place to trip a portion of the Desert Basin generation under loss of the Knox-Santa Rosa 230-kV transmission line. A second Santa Rosa 230/115-kV transformer bank may be required as a means to mitigate the project impacts if any planned remedial action schemes are determined to be insufficient to eliminate the increased overload.

4) Saguaro West-Empire 115-kV Transmission Line outage

The study identified that outage of the Saguaro West-Empire 115-kV transmission line results in loading the Santa Rosa 230/115-kV transformer bank in excess of the 167MVA rating prior to the addition of the Bowie Power Project. As mentioned above, this overload is attributed to the addition of the Desert Basin Generation and no emergency capability is identified to be available in the GE Datasets.

With the addition of the Bowie Power Project, the existing single contingency overloads identified was found to be aggravated. Overloads are increased from 106% up to 109%. A second Santa Rosa 230/115-kV transformer bank may be required as a means to mitigate the project impacts if any planned remedial action schemes are determined to be insufficient to eliminate the increased overload and no emergency capability is identified to be available.

Double Contingency Study Results

1) Cholla-Saguaro 500-kV and Coronado-Silverking 500-kV Transmission Line simultaneous outage

The study identified that simultaneous outage of the Cholla-Saguaro 500-kV and Coronado-Silverking 500-kV transmission lines result in three existing overloads.

- Cholla 500/345-kV No.1 Transformer Bank loads to 134%
- Cholla 500/345-kV No.2 Transformer Bank loads to 137%
- Cholla-Preacher Canyon 345-kV Transmission line loads up to 131%

With the addition of the Bowie Power Project, the study identified that four new transmission lines are overloaded. Additionally, the three existing overloads identified above were found to be aggravated as shown below:

- Cholla-Pinnacle Peak 345-kV Transmission line loads up to 136%
- Preacher Canyon-Pinnacle Peak 345-kV Transmission line loads up to 132%

- Cholla-Leupp 230-kV Transmission line loads up to 104%
- Leupp-Coconino 230-kV Transmission line loads up to 103%
- Loading on the Cholla 500/345-kV No.1 Transformer Bank is increased from 134% up to 147%.
- Loading on the Cholla 500/345-kV No.2 Transformer Bank is increased from 137% up to 150%
- Loading on the Cholla-Preacher Canyon 345-kV Transmission line is increased from 131% up to 140%

APS and SRP should evaluate risk factors involved with simultaneous outage of the Cholla-Saguaro 500-kV and Coronado-Silverking 500-kV transmission lines. These lines appear to have sections together in the same corridor and therefore were studied as "credible" simultaneous outages. Sufficient separation (i.e. different corridor) between the two lines could result in treating this simultaneous outage as overlapping single contingencies.

2) Cholla-Pinnacle Peak 345-kV and Cholla-Preacher Canyon 345-kV Transmission Line simultaneous outage

The study identified that simultaneous outage of the Cholla-Pinnacle Peak 345-kV and Cholla-Preacher Canyon 345-kV transmission lines result in loading the Pinnacle-Peak (APS)-Pinnacle Peak (WAPA) 230-kV transmission line in excess of the 1700 amp emergency rating prior to the addition of the Bowie Power Project. With the addition of the Bowie Power Project, the existing overload is increased from 115% up to 117%.

APS should evaluate the risk factors involved with simultaneous outage of these transmission lines and determine if sufficient time is available to implement manual generation run-back or load shedding schemes to mitigate such overload conditions.

3) Cholla-Pinnacle Peak 345-kV and Preacher Canyon-Pinnacle Peak 345-kV Transmission Line simultaneous outage

The study identified that simultaneous outage of the Cholla-Pinnacle Peak 345-kV and Preacher Canyon- Pinnacle Peak 345-kV transmission lines result in loading the Pinnacle-Peak (APS)-Pinnacle Peak (WAPA) 230-kV transmission line in excess of the 1700 amp emergency rating prior to the addition of the Bowie Power Project. With the addition of the Bowie Power Project, the existing overload is increased from 113% up to 115%.

APS should evaluate the risk factors involved with simultaneous outage of these transmission lines and determine if sufficient time is available to implement manual generation run-back or load shedding schemes to mitigate such overload conditions. Automatic remedial action schemes which may require Bowie participation may be necessary to mitigate this overload if it is determined that sufficient time is unavailable.

4) Springerville-Vail2 345-kV and Winchester-Vail 345-kV Transmission Line simultaneous outage

The study identified that simultaneous outage of the Springerville-Vail2 345-kV and Winchester-Vail 345-kV transmission lines results in overloading the Bicknell 345/230-kV transformer bank beyond the allowable emergency rating prior to the addition of the Bowie Power Project. With the project, the existing operating procedures appear to be insufficient to mitigate additional contributions. A second transformer bank should be explored as an option to mitigate existing overload as well as the Bowie Power Project contributions that is presently dealt with by with System Operating Procedures.

B. Transient Stability Study

Transient stability studies performed did not identify any system instability under all scenarios evaluated. As mentioned above in the Study Conditions and Assumptions section under Power Flow Study, Path 22 and 50 were not modeled at the maximum allowable limits of 2325 MW and 1200 MW respectively. Increased Path flows may result in stability problems that were not identified in this System Impact Study.

Table 4 summarizes the study results for each scenario. Stability plots for each case evaluated after the addition of the Bowie Power Project are included in Appendix H, Appendix I and Appendix J. The stability plots include Rotor Angle, Bus Voltage, and Bus Frequency.

Rotor Angle

The rotor angle plots shown in Appendix I through Appendix J provide a measure for determining how the proposed generation units would swing with respect to one another. The plots also provide a measure of how the units would swing with respect to other generation units in the area.

Bus Voltage

The bus voltage plots, in conjunction with the relative rotor angle plots, also shown in Appendix I through Appendix J, provide a means of detecting out-of-step conditions. The bus voltage plots are useful in assessing the magnitude and the duration of post disturbance voltage dips and peak-to-peak voltage oscillations. The bus voltage plots also give an indication of system damping and the level to which voltages are expected to recover in steady state conditions.

Bus Frequency

The bus frequency plots provide information on the magnitude and the duration of post fault frequency swings with the proposed Bowie Power Project in service. These plots indicate the extent of possible over-frequency or under-frequency, which can occur because of the imbalance between the generation and load within an area.

C. Post Transient Voltage Study

The steady state load flow study was used as an initial screening method for voltage deviation violations. The screening process did not identify any outages that resulted in steady-state voltage drops in excess of 5%. Post transient voltage studies were therefore performed only on two single contingencies that produced the highest voltage drops. No post-transient voltage criteria violations were identified with or without the Bowie Power Project.

D. Short Circuit Duty Study

Short circuit duty analysis was conducted by TEP's Protection and Communication Engineering Department. All TEP breakers are rated 40 kA. Short circuit duties were monitored at seven TEP EHV buses in the vicinity of the Bowie project. The short circuit duty at all monitored buses were within the capability of the breakers.

E. Reliability Must Run Generation

For the pre-Bowie system, three level B contingencies caused voltage drops slightly greater than the allowable 5%. These voltage drops can be alleviated by the automated reactive device switching. The Winchester / Vail line caused an overload on the Bicknell transformer which was below the trip setting. TEP and SWTC are involved in discussions on mitigation measures for the Bicknell overload.

For the post-Bowie system, the outage of TEP's South 345/138 kV transformer caused an overload on TEP's Irvington / Vail 138 kV transmission line. Please refer to Appendices L and M for details of the outage report.

For the pre-Bowie system, all level C contingencies met criteria, with two outages requiring small amounts of direct load tripping via TEP's Tie Open Load Shed scheme. In the post-Bowie system, five different level C outages caused overloads that could not be remedied by the Tie Open Load Shed scheme. Please see Appendices L and M for details of the outage report.

In some situations, a level D contingency on TEP's system will overload SWTC's Bicknell 345/230 kV transformer above its trip setting of 240 MW. Prior to the Bowie interconnection, the only level D contingency that causes this overload/trip condition of the Bicknell transformer is the Springerville corridor outage of the Springerville-Vail and Winchester-Vail 345 kV lines. Since this is a level D outage, TEP chooses to allow the Bicknell transformer to trip on overload, and utilizes sufficient direct load tripping to meet TEP internal criteria.

For the pre-Bowie system, all level D contingencies met internal TEP criteria, with one outage, of Winchester / Vail and Springerville / Vail 345 kV lines, causing the Bicknell transformer to trip.

After the Bowie interconnection, at the same TEP load and local generation level, there are many more level D outages that cause the Bicknell transformer to overload above its trip level. The outage that tripped Bicknell prior to the Bowie interconnection, Winchester / Vail and Springerville / Vail, with a Bicknell trip, overloaded TEP's Tortolita / North Loop lines 117 and 118. Please refer to Appendices L and M for details of the outage report.

LEVEL D AND N-1-1 LEVEL C RELATIONSHIP

Level D outages are significant in that they can also occur as NERC N-1-1 level C outages, with system adjustment after the first outage, followed by a 2nd outage. Prior to the Bowie interconnection, there is sufficient system adjustment available, in the form of local generation, so that the N-1-1 criterion can be met for the Springerville corridor outage that trips Bicknell.

Although the post-Bowie N-1-1 contingencies that trip Bicknell as level D outages have not been studied, there is a strong likelihood that it will not be possible to adjust the system so that the WECC/NERC criteria are met for many system-adjusted N-1-1 outages. In that case, Bowie generation would have to be curtailed immediately after an outage of any single system element, as part of system adjustment for a subsequent N-1 outage. In addition, there would be a significant increase in operating study work required to determine the needed system adjustments after any of these single outages.

F. <u>Two-County Analysis</u>

The Bowie generator MW output has a detrimental effect on TEP's ability to meet Two County criteria. In general, for each 50 MW of MW generated at the Bowie power plant in the base cases used, the Express Line flow decreased by five to six MW.

The high city load base case had a high Express Line flow, and full Bowie output did not require that Springerville Unit 2's MW output be lowered to meet Two County criteria. However, it must be noted that actual system conditions even at very high loads can often affect Express Line flows, and any Bowie output will worsen these existing effects. It should be understood that the somewhat optimal conditions reflected in the high load base case are not predictive of actual operating conditions at all times at high loads.

The low city load base case had sufficient Express Line flow with minimal local generation on line and the Tortolita Phase Shifter in service. In this base case, a Bowie generation level of more than 150 MW lowered Express Line flows sufficiently that in actual operating conditions, Springerville Unit 2 would have to have its output curtailed in order to meet Two County criteria. The same pattern of 5-6 MW lessening of flow on the Express Line for every 50 MW of Bowie generation held true in this base case. Maximum generation of 540 MW on Bowie required Springerville Unit 2 to be curtailed from 380 MW to 334 MW. Once again, it should be understood that the optimal conditions of very low local generation and system configuration are reflected in the amount that Springerville Unit 2 needed to be curtailed; and higher local generation on line, as well as unpredictable system conditions, could cause further curtailments of Springerville Unit 2 not documented in this study.

To relieve the detrimental effects of Bowie MW output on Express Line flow, TEP will require operating protocols that detail curtailment requirements for Springerville Unit 2, that will be reimbursed to TEP by Bowie or its off-taker. This implies that Bowie generation cannot produce power until Springerville Unit #2 is adjusted, and Two County criteria are being met with sufficient "head room" for Bowie to come on line at a reasonable MW output.

G. Sensitivity Studies

Power flow studies performed for the various sensitivity scenarios identified a number of transmission facilities that are adversely impacted by the addition of the Bowie Power Project and exclusion of the Springerville Unit 3 & 4 Power project. Tables 3-1 through 3-3 summarize the sensitivity power flow study results.

Below is a detailed description of each facility impacted and potential system mitigation that should be addressed by the corresponding utility owner in either the Facilities Study or Transmission Service Request Study:

Single Contingency Study Results

1) Springerville-Luna 345-kV Transmission Line outage

With the addition of the Bowie Power Project, the sensitivity study (without Springerville Units 3 & 4) identified that outage of the Springerville-Luna 345-kV transmission line results in overloading the Hidalgo-Greenlee 345-kV transmission line. Line loading is increased from 99% pre-project to 101% after the addition of the project under this outage condition.

2) Knox-Santa Rosa 230-kV Transmission Line outage

The sensitivity study (without Springerville Units 3 & 4) identified that outage of the Knox-Santa Rosa 230-kV transmission line results in loading the Santa Rosa 230/115-kV transformer bank in excess of the 167MVA rating prior to the addition of the Bowie Power Project. This overload is attributed to the addition of the Desert Basin Generation.

With the addition of the Bowie Power Project, the existing single contingency overloads identified was found to be aggravated. Overloads are increased from 124% up to 131%.

3) <u>Saguaro West-Empire 115-kV Transmission Line outage</u>

The sensitivity study (without Springerville Units 3 & 4) identified that outage of the Saguaro West-Empire 115-kV transmission line results in loading the Santa Rosa 230/115-kV transformer bank in excess of the 167MVA rating prior to the addition of the Bowie Power Project. As mentioned above, this overload is attributed to the addition of the Desert Basin Generation.

With the addition of the Bowie Power Project, the existing single contingency overloads identified was found to be aggravated. Overloads are increased from 105% up to 107%.

Double Contingency Study Results

1) <u>Cholla-Saguaro 500-kV and Coronado-Silverking 500-kV Transmission Line simultaneous outage</u>

The sensitivity study (without Springerville Units 3 & 4) identified that simultaneous outage of the Cholla-Saguaro 500-kV and Coronado-Silverking 500-kV transmission lines result in two existing overloads.

- Cholla 500/345-kV No.1 Transformer Bank loads to 108%
- Cholla 500/345-kV No.2 Transformer Bank loads to 110%

With the addition of the Bowie Power Project, the sensitivity study (without Springerville Units 3 & 4) identified that the two existing overloads are aggravated.

- Loading on the Cholla 500/345-kV No.1 Transformer Bank is increased from 108% up to 121%.
- Loading on the Cholla 500/345-kV No.2 Transformer Bank is increased from 110% up to 123%

2) <u>Cholla-Pinnacle Peak 345-kV and Cholla-Preacher Canyon 345-kV Transmission Line simultaneous outage</u>

The sensitivity study (without Springerville Units 3 & 4) identified that simultaneous outage of the Cholla-Pinnacle Peak 345-kV and Cholla-Preacher Canyon 345-kV transmission lines result in loading the Pinnacle-Peak (APS)-Pinnacle Peak (WAPA) 230-kV transmission line in excess of the 1700 amp emergency rating prior to the addition of the Bowie Power Project. With the addition of the Bowie Power Project, the existing overload is increased from 114% up to 127%.

3) <u>Cholla-Pinnacle Peak 345-kV and Preacher Canyon-Pinnacle Peak 345-kV Transmission Line simultaneous outage</u>

The sensitivity study (without Springerville Units 3 & 4) identified that simultaneous outage of the Cholla-Pinnacle Peak 345-kV and Preacher Canyon- Pinnacle Peak 345-kV transmission lines result in loading the Pinnacle-Peak (APS)-Pinnacle Peak (WAPA) 230-kV transmission line in excess of the 1700 amp emergency rating prior to the addition of the Bowie Power Project. With the addition of the Bowie Power Project, the existing overload is increased from 111% up to 124%.

4) <u>Springerville-Vail2 345-kV and Winchester-Vail 345-kV Transmission Line simultaneous outage</u>

The sensitivity study (without Springerville Units 3 & 4) identified that simultaneous outage of the Springerville-Vail2 345-kV and Winchester-Vail 345-kV transmission lines results in loading the Bicknell 345/230-kV transformer banks in excess of the allowable emergency limits. As mention above in the SIS section, this is an existing condition that is aggravated with the addition of the Bowie Power Project.

CONCLUSIONS

Since market dispatch conditions are unknown ahead of scheduling, the 2005 heavy summer set of conditions analyzed provide scenarios for testing the Bowie Power Project impacts under conditions that credibly represent potential market conditions for integrating additional market generation. These conditions are snapshots of a simultaneous use limit that does not envelop all possible combinations. Efforts were made to try and capture worst case scenarios that may result under the given Path 22 and Path 50 power flows modeled.

Studies identified that the existing and planned facilities (2005) are adequate to provide service to the proposed Bowie Power Project under normal conditions with facilities in service.

The study has identified additional need for physical upgrades to mitigate overloads resulting from four single and three double outage conditions. It should be noted that the power flow cases did not represent maximum Southwest of Four Corners (Path 22) and maximum Cholla-Pinnacle Peak (Path 50) power flows. The following line and transformer bank overloads are seen with the Bowie Power Project at maximum output under the scenarios evaluated:

1. Outage of the Coronado-Silverking 500-kV transmission line results in overloading the Cholla 500/345-kV No.1 and No.2 transformer banks. Pre-Project loading was identified at 89% and 91% respectively with post-project loading identified to be at 104% and 105% respectively. No emergency capability is listed in the GE datasets. Sensitivity studies performed without the addition of the Springerville Unit 3 & 4 expansion project demonstrated that these overloads would not occur under such scenario.

2. Outage of the Springerville-Luna 345-kV transmission line results in overloading the Hidalgo-Greenlee 345-kV transmission line. Pre-project loading was identified to be at 99% and post-project loading was identified to be at 102%. No emergency capability is listed in the GE datasets.

3. Outage of the Knox-Santa Rosa 230-kV transmission line results in overloading the Santa Rosa 230/115-kV transformer bank. Pre-project loading was identified to be at 129% and post-project loading was identified to be at 136%. The overload is an existing overload triggered by a project in queue ahead of the Bowie Power Project request, which is aggravated by the addition of the Bowie Power Project. Remedial Action Schemes or facility upgrades that may be in place to mitigate this overload should be reviewed to ensure no additional upgrades are required as a result of the Bowie Power Project.

4. Outage of the Saguaro West-Empire 115-kV transmission line results in overloading the Santa Rosa 230/115-kV transformer bank. Pre-project loading was identified to be at 106% and post-project loading was identified to be at 109%. As mentioned above, the overload is an existing overload, which is aggravated by the addition of the Bowie Power Project.

5. Simultaneous outage of the Cholla-Saguaro 500-kV and Coronado-Silverking 500-kV transmission lines results in overloading transformer banks and transmission lines as summarized below:

    - Loading on the Cholla 500/345-kV No.1 transformer bank is aggravated (increased from 134% up to 147%) with the addition of the Bowie Power Project. This is an existing overload that is limited to the bank normal rating since no emergency rating is defined to be available in the GE datasets.

    - Loading on the Cholla 500/345-kV No.2 transformer bank is aggravated (increased from 137% up to 150%) with the addition of the Bowie Power Project. This is an existing overload that is limited to the bank normal rating since no emergency rating is defined to be available in the GE datasets.

    - Loading on the Cholla-Preacher Canyon 345-kV transmission line is aggravated (increased from 131% up to 140%) with the addition of the Bowie Power Project. Emergency capability on this line is limited to no more than 130%.

    - Loading on the Cholla-Pinnacle Peak 345-kV transmission line is increased beyond the emergency capability of 130% with the addition of the Bowie Power Project. Pre-project loading was identified to be 127% while post-project loading increased to 136%.

    - Loading on the Preacher Canyon-Pinnacle Peak 345-kV transmission line is increased beyond the emergency capability of 130% with the addition of the Bowie Power Project. Pre-project loading was identified to be 123% while post-project loading increased to 132%.

    - Loading on the Cholla-Leupp 230-kV transmission line is increased beyond the allowable limit of 100% with the addition of the Bowie Power Project. No emergency capability is identified to be available in the GE datasets. Pre-project loading was identified to be 96% while post-project loading increased to 104%.

- Loading on the Leupp-Coconino 230-kV transmission line is increased beyond the allowable limit of 100% with the addition of the Bowie Power Project. No emergency capability is identified to be available in the GE datasets. Pre-project loading was identified to be 95% while post-project loading increased to 103%.

Sensitivity studies performed without the addition of the Springerville Unit 3 & 4 expansion project demonstrated that only the overloads on the Cholla 500/345-kV No.1 and No.2 transformer banks would remain under such scenario.

6. Simultaneous outage of the Cholla-Pinnacle Peak 345-kV and Cholla-Preacher Canyon 345-kV transmission lines results in overloading the Pinnacle Peak (APS)-Pinnacle Peak (WAPA) 230-kV transmission line. Pre-project loading was identified to be at 115% and post-project loading was identified to be up to 132%. The overload is an existing overload that is aggravated by the addition of the Bowie Power Project. Remedial Action Schemes that may be in place to mitigate this overload should be reviewed to ensure no additional action is required as a result of the Bowie Power Project.

7. Simultaneous outage of the Cholla-Pinnacle Peak 345-kV and Preacher Canyon-Pinnacle Peak 345-kV transmission lines results in overloading the Pinnacle Peak (APS)-Pinnacle Peak (WAPA) 230-kV transmission line. Pre-project loading was identified to be at 113% and post-project loading was identified to be up to 130%. The overload is an existing overload that is aggravated by the addition of the Bowie Power Project. Remedial Action Schemes that may be in place to mitigate this overload should be reviewed to ensure no additional action is required as a result of the Bowie Power Project.

8. Simultaneous outage of the Springerville-Vail2 345-kV and Winchester-Vail 345-kV transmission lines results in overloading the Bicknell 345/230-kV transformer bank beyond the allowable emergency rating. This is an existing overload that is aggravated with the addition of the Bowie Power Project. Bowie Power Project will be required to participate in mitigation measures such as generation tripping in order to mitigate contributions associated with the Bowie Power Project. A second transformer bank should be explored as an option to mitigate existing overload as well as Bowie Power Project contribution that is presently dealt with by implementation of an Operating Procedure. The Operating Procedure does not appear to be sufficient after the addition of the Bowie Power Project.

No system transient stability or post-transient voltage problems were identified with the addition of the Bowie Power Project. However, the Bowie Power Project may be subject to scheduling limitations not identified in this report to ensure that the transmission path flows stay within thermal and/or operational limits. Operational studies should be conducted to identify if the Bowie Power Project adversely impacts Path 22 and Path 50.

A Facility Study will be needed to determine the interconnection facilities and system upgrades required to interconnect the Bowie Power Project consistent with FERC protocols and policies. The study should address the following scope:

1. Determine the interconnection facilities and cost required to integrate the Bowie Power Project to the existing system. These facilities should include:

   a. proposed Willow 345-kV switchyard facilities, circuit breakers, relay protection, communication and metering
   b. proposed short line extensions required to loop existing Winchester-Greenlee 345kV transmission line into the proposed Willow 345/230-kV substation
   c. one (potential for two) 14.5 mile 2B-954 ACSR 345-kV radial line(s) from the proposed Willow 345-kV substation required to serve the proposed Bowie substation
   d. proposed Bowie switchyard facilities, circuit breakers, relay protection, and metering
   e. necessary communication requirements to the proposed Bowie substation
   f. additional direct connect facilities and mitigations not identified above such as possible land acquisition, environmental impact mitigation, etc.

2. Determine facility upgrades required to maintain existing system reliability. This will include the following:

   a. complete short-circuit duty engineering review of all breakers located in the TEP transmission system.
   b. complete evaluation of existing remedial action schemes to ensure that the schemes are still adequate after the addition of the Bowie Power Project

A Transmission Service Request Study will be needed to determine the transmission facilities and system upgrades required to transmit Bowie Power Project energy throughout the State of Arizona consistent with FERC protocols and policies. The study should address the following scope:

1. Determine facility upgrades and cost requirements necessary to mitigate single contingency overloads identified on the following:

   a. Cholla 500/345-kV No.1 Transformer Bank
   b. Cholla 500/345-kV No.2 Transformer Bank
   c. Hidalgo-Greenlee 345-kV Transmission Line
   d. Santa Rosa 230/115-kV Transformer Bank

2. Determine if congestion management is a feasible alternative or identify facility upgrades and/or mitigation measures and cost requirements needed to mitigate double contingency overloads identified on the following:

   a. Cholla 500/345-kV No.1 Transformer Bank
   b. Cholla 500/345-kV No.2 Transformer Bank

c. Cholla-Pinnacle Peak 345-kV Transmission Line (increased from 127% up to 136%)
d. Cholla-Preacher Cyn 345-kV Transmission Line (increased from 131% up to 140%)
e. Cholla-Leupp 230-kV Transmission Line (increased from 96% up to 104%)
f. Leupp-Coconino 230-kV Transmission Line (increased from 95% up to 103%)
g. Pinnacle Peak (APS)-Pinnacle Peak (WAPA) 230-kV Transmission Line (increased from 115% up to 117%)
h. Preacher Cyn-Pinnacle Peak 345-kV Transmission Line (increased from 123% up to 132%)
i. Bicknell 345/230-kV Transformer Bank

3. Evaluate operating procedures ("Two-County Rule") that may be impacted with the addition of the project.

4. Identify new operating procedures that will be required for those facilities where congestion protocols were implemented in lieu of facility upgrades. Actual operating procedures and studies to support those procedures will not be developed until the Facility Interconnection and Operation Agreement is executed. Any operating procedure change or additional new operating procedure will require TEP and other impacted utilities' review and approval. These approvals will be obtained after FIOA execution, and prior to service connection for testing and operation.

Bowie Interconnection Request
Dec. 3rd Meeting

In attendance

- Bowie: Jeff Schroetter, Jennifer Tripp
- TEP XMSN Planning: Mary Ann Tilford, Gary Trent, Ed Beck, Mark Albertson, Frances Moseley
- TEP Engineering: Scott Horton, John Dangremond
- TEP Legal: Erik Bakken

Current Project Status

- **Toltec Power Project** – challenging the ACC vote to not allow CEC. Judicial action is not expected before Q2 2003.
- **Bowie –**
  - Actively soliciting utility customers to purchase power from the project. Potential customers include AEPC, Tri-State, & TEP
  - **Project Goal** – focus on construction date to commence in 2003 with operation date for Dec. 2005
  - The project is going through the approval process with Cochise County.
  - Bowie wants an interconnect agreement, yet is not interested in a xmsn service agreement until they know where the power is going.

System Impact Study

- There are several small overloads, which may be relieved with congestion management.
- Jeff: What is TEP's position on small overload issues (those handled by congestion management)?
- Ed: There are no short circuit or stability issues raised in the study. There are scheduling issues that affect adjacent systems. TEP's position is that we will follow FERC, which says it's OK if there are no short circuit or stability issues.
- SWPG wants copy of data sets – need to confirm SWPG as WECC members
- SWPG needs copy of appendices (Power Flow Models?)

Facilities Study

- The cost estimate is as precise as could be without actually being in production. The cost estimate includes communications issues: TOLS, RA, and EMS changes.
- No line item was included for contingencies.
- John: the project could save ~ 2 miles of transmission line if it was sited along a more direct route and would possibly eliminate any wash concerns.
- SWPG: Voiced concern regarding having to cross existing federal lands if this option were to be taken.
- SWPG indicated that they thought the cost estimates were a little high. Scott indicated that the estimates were consistent with work being done for both the Gateway and Winchester projects.
- The prices in the estimate were based on 3rd party pricing. The company would probably sub out the project to a 3rd party.
- Karen asked if TEP would use ACSS conductor on the project to which John replied that the company only uses ACSS where applicable.

Commercial Issues

- There was an IRS private letter ruling in December 2001(?) relating to the tax gross up of CIAC, which was a favorable ruling for utilities. Jeff indicated that he would forward some documentation to Frances regarding the ruling. Gross up would be eliminated for contributions from generator to TEP.
- TEP is not opposed to receiving the xmsn line asset in exchange for xmsn credits, however, the xmsn credit issue has not been finalized by FERC.
- The project would need to be built to TEP standards.

Two-County issues

- Two-county restrictions cause great difficulty due to the limitations on system flows. Restrictions for two-county require that the flow has to be into Tucson at all times. It does not matter who the generator is.
- The affect of new generation on two-county flows is location and quantity dependent. Once city load reaches a certain level, Bowie generation will require a higher RMR due to increased loading on the xmsn line.
- At low load levels with Bowie online, TEP will have to curtail Springerville Unit 2 in order to maintain compliance with two-county restrictions. TEP doesn't want to curtail Springerville, as it is the company's least expensive resource. The initial thought was to no let Bowie operate during these conditions. Jeff voiced the possibility of somehow compensating TEP financially for these situations. In other words, Bowie would generate Springerville 2 would be curtailed and Bowie would pay TEP for the privilege of operating during these conditions.
- SWPG had several questions regarding the financing for two-county: how much obligation still remained, when the debt matures, etc. Jeff raised the possibility of SWPG putting up the money to pay off the obligation so TEP would not have to operate its system under the two-county restrictions. Mark offered to put Jeff in contact with someone in the Finance Department who could answer his questions more accurately.
- Results of two-county restrictions have been added to the Revised SIS (dated 12/4/02). Results indicate that for every 50 MW of Bowie generation, flow goes down by 5% and Springerville 2 needs to have a minimum of 240 MW. Frances to forward SIS as revised by Mary Ann as it identifies many major impacts on the system that will require system upgrades.

RMR -reliability must run.
The ACC has indicated that AZ utilities are to decrease their RMR

Cost Estimate Layout

- Hardcopy of the three breaker ring bus was given to SWPG to take back to Tom Wray.

Interconnect Agreement

- There are lots of stray comments in the document.
- SWPG indicated that they did not do extensive legal review.
- Jeff wanted to know if changes could be made. TEP is not opposed to making changes, but material items will have to be reviewed by legal department. TEP will consider any comments that Bowie has regarding the agreement.
- Jeff is interested in a "stair-step" agreement. For example: have an agreement (or part of an agreement) for engineering only and have the second agreement (or part) when the project gets the go ahead to order materials and equipment.

1.16 – is TEP's standard not sure if is current standard used by SRP or APS

1.18 – "must run generation" to be replaced by "RMR generation"; TEP to revise language

2.2 – Bowie would like it to be for life of project

3.6 - TEP open to Appendix A

5.8.1 – Bowie should not be required to provide supply reactive power w/o economic compensation

5.14 – Continuity of Service – Bowie sees this as too broad and will provide suggested alternative language. TEP to investigate with FERC.

9.2.1 - Standard language for xmsn right of way – TEP to confer with Lee Aikin

9.2.2 – Would like allowance for choice to be made, later will provide proposed language in order that FERC trend be recognized.

9.4 – system upgrades – xmsn interconnections

9.4.1 –

10.1 –

12 – does this allow SWTC in the yard or do we need to have a split yard w/ shared communications

13.1 – to work together with Bowie

15.1 – Credit worthiness – Bowie to propose language

20.1 c – would like materiality standard – Bowie to propose language

21.2 – Termination – do not want TEP to be able to terminate w/o Bowie being able to intervene.

- Bowie would like to sign an agreement, but does not want to do so prematurely. Bowie wants to come back with milestones and schedules before agreement is executed.

Next Steps

- TEP to finalize the SIS and send it to Jeff.
- TEP will clean up the IA: delete the Springerville stuff and add in some language where Jeff made suggestions. Jeff doesn't expect the cleaned up version until mid-January 2003. Jeff also does not expect that this version will be the final version; he plans to make some additional suggested changes once he receives our cleaned up version.
- Can Jeff have the file of data that is behind the study? We have to check on SWPG's status with WECC before we can forward them the data.

Gtway-1950.sav FROM BOWIE POWER STATION, LCC
REVISED SYSTEM IMPACT STUDY, 2005 HEAVY SUMMER
PRE-BOWIE CASE No 2nd Bicknell xfmr.
Gateway and nearby buses put in zone 160.

NETGEN: 146
Outages below are NERC level D. These are outages that must be survived according to TEP internal criteria.

WINCHSTR	345 VAIL	345	1	1	SPRINGR	345 VAIL2	345	1	1	BICKNELL	345 BICKNELL	230	1	0	620	1950	DS	VL	TH	1.042								Bicknell allowed to trip
WESTWING	345 SOUTH	345	1	1	WINCHSTR	345 VAIL	345	1	1						480	1950	DS	VL	TH	1.0541	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	196.9	193	Bicknell below trip at this LS level
HIDALGO	345 GREENLEE	345	1	1	WINCHSTR	345 VAIL	345	1	1						460	1950	--	VL	TH	1.0529	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	212.7	193	Bicknell below trip at this LS level
HIDALGO	345 GREENLEE	345	1	1	WINCHSTR	345 VAIL	345	1	1						460	1950	--	VL	TH	1.0529	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	212.8	193	Bicknell below trip at this LS level
WINCHSTR	345 VAIL	345	1	1	CHOLLA	500 SAGUARO	500	1	1						440	1950	DS	VL	TH	1.0434								
WINCHSTR	345 VAIL	345	1	1	WESTWING	500 WESTWING	345	1	0						420	1950	DS	VL	TH	1.0521	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	210.8	193	Bicknell below trip at this LS level
CHOLLA	500 SAGUARO	500	1	1	SOUTH	345 SOUTH	138	1	0						400	1950	DS	VL	TH	1.0383								
SAGUARO	500 TORTOLIT	500	1	1	SAGUARO	500 TORTLIT2	500	1	1						380	1950	DS	VL	--	1.0336		AVRA	115 MARANA	115	1	80	78.9	
SOUTH	345 SOUTH	138	1	0	VAIL	345 VAIL	138	1	0						380	1950	DS	VL	--	0.9886								
GREENLEE	345 WINCHSTR	345	1	1	WINCHSTR	345 VAIL	345	1	1						340	1950	--	--	TH	1.0409								
SAGUARO	500 TORTOLIT	500	1	1	TORTOLIT	138 TORTLIT2	500	1	0						320	1950	DS	VL	--	1.0149		AVRA	115 MARANA	115	1	83.9	78.9	
SAGUARO	500 TORTLIT2	500	1	1	TORTOLIT	138 TORTOLIT	500	1	0						320	1950	DS	VL	--	1.0149		AVRA	115 MARANA	115	1	83.9	78.9	
GREENLEE	345 WINCHSTR	345	1	1	WINCHSTR	345 VAIL	345	1	1						320	1950	--	--	TH	1.047								
SAGUARO	500 TORTOLIT	500	1	1	WINCHSTR	345 VAIL	345	1	1						300	1950	--	VL	TH	1.0475								
SPRINGR	345 VAIL2	345	1	1	SOUTH	345 SOUTH	138	1	0						300	1950	DS	VL	TH	1.0177								
SAGUARO	500 TORTLIT2	500	1	1	WINCHSTR	345 VAIL	345	1	1						300	1950	--	VL	TH	1.0494								
WINCHSTR	345 VAIL	345	1	1	TORTOLIT	138 TORTOLIT	500	1	0						300	1950	--	VL	TH	1.0484								
WINCHSTR	345 VAIL	345	1	1	TORTOLIT	138 TORTLIT2	500	1	0						300	1950	--	VL	TH	1.0474								
SOUTH	345 SOUTH	138	1	0	VAIL2	345 VAIL	138	1	0						300	1950	DS	VL	TH	1.0171								
SAGUARO	500 TORTOLIT	500	1	1	WINCHSTR	345 VAIL	345	1	1						300	1950	--	VL	TH	1.0485								
SAGUARO	500 TORTLIT2	500	1	1	WINCHSTR	345 VAIL	345	1	1						300	1950	--	VL	TH	1.0494								
WINCHSTR	345 VAIL	345	1	1	TORTOLIT	138 TORTOLIT	500	1	0						300	1950	--	VL	TH	1.0493								
WINCHSTR	345 VAIL	345	1	1	TORTOLIT	138 TORTLIT2	500	1	0						300	1950	--	VL	TH	1.0474								
SPRINGR	345 CORONADO	345	1	1	WINCHSTR	345 VAIL	345	1	1						280	1950	--	VL	TH	1.0454								
SPRINGR	345 CORONADO	345	1	1	WINCHSTR	345 VAIL	345	1	1						280	1950	--	VL	TH	1.0454								
SPRINGR	345 VAIL2	345	1	1	VAIL	345 VAIL	138	1	0						260	1950	DS	VL	TH	1.0032								
VAIL	345 VAIL	138	1	0	VAIL2	345 VAIL	138	1	0						260	1950	DS	VL	TH	1.0058								
TORTOLIT	138 TORTOLIT	500	1	0	TORTOLIT	138 TORTLIT2	500	1	0						260	1950	DS	VL	--	0.9882		AVRA	115 MARANA	115	1	88.2	78.9	
SPRINGR	345 GREENLEE	345	1	1	SPRINGR	345 VAIL2	345	1	1						180	1950	DS	VL	TH	1.0088								
SPRINGR	345 GREENLEE	345	1	1	VAIL2	345 VAIL	138	1	0						160	1950	--	VL	TH	1.0039								
SPRINGR	345 VAIL2	345	1	1	WESTWING	345 SOUTH	345	1	1						160	1950	DS	VL	TH	1.0014								
SPRINGR	345 VAIL2	345	1	1	WESTWING	500 WESTWING	345	1	0						160	1950	DS	VL	TH	1.0212								
WINCHSTR	345 VAIL	345	1	1	CORONADO	500 CORONADO	345	1	0						160	1950	--	--	TH	1.0242								
WINCHSTR	345 VAIL	345	1	1	CORONADO	500 CORONADO	345	2	0						160	1950	--	--	TH	1.0242								
WESTWING	500 WESTWING	345	1	0	VAIL2	345 VAIL	138	1	0						160	1950	DS	VL	TH	1.0228								
WINCHSTR	345 VAIL	345	1	1	CORONADO	500 CORONADO	345	1	0						160	1950	--	--	TH	1.0242								
WINCHSTR	345 VAIL	345	1	1	CORONADO	500 CORONADO	345	2	0						160	1950	--	--	TH	1.0242								
WINCHSTR	345 VAIL	345	1	1	GATEWAY	115 GATEWAY	345	1	0						160	1950	--	--	TH	1.029								
WINCHSTR	345 VAIL	345	1	1	WINCHSTR	345 WINCHSTR	230	1	0						160	1950	--	--	TH	1.0248								
WINCHSTR	345 VAIL	345	1	1	WINCHSTR	345 WINCHSTR	230	2	0						160	1950	--	--	TH	1.0248								
SPRINGR	345 VAIL2	345	1	1	CHOLLA	500 SAGUARO	500	1	1						140	1950	DS	VL	--	0.9892								
WESTWING	345 SOUTH	345	1	1	VAIL2	345 VAIL	138	1	0						140	1950	DS	VL	TH	0.9958								
GREENLEE	345 WINCHSTR	345	1	1	VAIL2	345 VAIL	138	1	0						140	1950	DS	VL	TH	0.9987								
WINCHSTR	345 VAIL	345	1	1	MCKINLEY	345 YAHTAHEY	115	1	0						140	1950	--	--	TH	1.0197								
WINCHSTR	345 VAIL	345	1	1	SOUTH	345 SOUTH	138	1	0						140	1950	DS	VL	--	0.9842								
WINCHSTR	345 VAIL	345	1	1	MCKINLEY	345 YAHTAHEY	115	1	0						140	1950	--	--	TH	1.0197								
SAGUARO	500 TORTOLIT	500	1	1	SPRINGR	345 VAIL2	345	1	1						120	1950	--	VL	TH	1.0066								
SAGUARO	500 TORTOLIT	500	1	1	VAIL2	345 VAIL	138	1	0						120	1950	--	VL	TH	1.0077								
SPRINGR	345 VAIL2	345	1	1	SAGUARO	500 TORTLIT2	500	1	1						120	1950	--	VL	TH	1.0067								
SPRINGR	345 VAIL2	345	1	1	GREENLEE	345 WINCHSTR	345	1	1						120	1950	DS	VL	TH	0.9917								
SPRINGR	345 VAIL2	345	1	1	TORTOLIT	138 TORTOLIT	500	1	0						120	1950	--	VL	TH	1.0066								
SPRINGR	345 VAIL2	345	1	1	TORTOLIT	138 TORTLIT2	500	1	0						120	1950	--	VL	TH	1.0066								
SAGUARO	500 TORTLIT2	500	1	1	VAIL2	345 VAIL	138	1	0						120	1950	--	VL	TH	1.0077								
CHOLLA	500 SAGUARO	500	1	1	VAIL2	345 VAIL	138	1	0						120	1950	DS	VL	--	0.9823								
VAIL2	345 VAIL	138	1	0	TORTOLIT	138 TORTOLIT	500	1	0						120	1950	--	VL	TH	1.0076								
VAIL2	345 VAIL	138	1	0	TORTOLIT	138 TORTLIT2	500	1	0						120	1950	--	VL	TH	1.0076								
SAN_JUAN	345 MCKINLEY	345	1	1	WINCHSTR	345 VAIL	345	1	1						120	1950	--	--	TH	1.0158								
SAN_JUAN	345 MCKINLEY	345	2	1	WINCHSTR	345 VAIL	345	1	1						120	1950	--	--	TH	1.0158								
MCKINLEY	345 SPRINGR	345	1	1	WINCHSTR	345 VAIL	345	1	1						120	1950	--	--	TH	1.0147								
MCKINLEY	345 SPRINGR	345	2	1	WINCHSTR	345 VAIL	345	1	1						120	1950	--	--	TH	1.0149								
GREEN-AE	345 GREENLEE	345	1	1	WINCHSTR	345 VAIL	345	1	1						120	1950	--	--	TH	1.0147								
SAGUARO	500 TORTOLIT	500	1	1	SOUTH	345 SOUTH	138	1	0						100	1950	--	VL	TH	0.9985								
SPRINGR	345 GREENLEE	345	1	1	CHOLLA	500 SAGUARO	500	1	1						100	1950	--	VL	TH	0.9996								
SAGUARO	500 TORTLIT2	500	1	1	SOUTH	345 SOUTH	138	1	0						100	1950	--	VL	TH	0.9985								
SOUTH	345 GATEWAY	345	1	1	WINCHSTR	345 VAIL	345	1	1						100	1950	--	VL	TH	0.9984								
SOUTH	345 GATEWAY	345	2	1	WINCHSTR	345 VAIL	345	1	1						100	1950	--	VL	TH	0.9984								
SOUTH	345 SOUTH	138	1	0	TORTOLIT	138 TORTOLIT	500	1	0						100	1950	--	VL	TH	0.9984								
SOUTH	345 SOUTH	138	1	0	TORTOLIT	138 TORTLIT2	500	1	0						100	1950	--	VL	TH	0.9993								
SOUTH	345 GATEWAY	345	1	1	WINCHSTR	345 VAIL	345	1	1						100	1950	--	VL	TH	0.9984								
SOUTH	345 GATEWAY	345	2	1	WINCHSTR	345 VAIL	345	1	1						100	1950	--	VL	TH	0.9996								

Gtway-1950.sav FROM BOWIE POWER STATION, LCC
REVISED SYSTEM IMPACT STUDY, 2005 HEAVY SUMMER
PRE-BOWIE CASE No 2nd Bicknell xfmr.
Gateway and nearby buses put in zone 160.

NETGEN: 146
Outages below are NERC level D. These are outages that must be survived according to TEP internal criteria.

SPRINGR	345 LUNA	345	1	1	SPRINGR	345 GREENLEE	345	1	1	80	1950	--	VL	TH	0.989
VAIL	345 SOUTH	345	1	1	VAIL	345 VAIL	138	1	0	80	1950	DS	VL	--	0.9801
BICKNELL	345 VAIL	345	1	1	WINCHSTR	345 VAIL	345	1	1	80	1950	DS	VL	--	0.9836
CHOLLA	500 SAGUARO	500	1	1	VAIL	345 VAIL	138	1	0	80	1950	DS	VL	--	0.9855
SPRINGR	345 LUNA	345	1	1	SPRINGR	345 VAIL2	345	1	1	60	1950	--	VL	--	0.9855
SPRINGR	345 GREENLEE	345	1	1	SOUTH	345 SOUTH	138	1	0	60	1950	--	VL	--	0.983
VAIL	345 SOUTH	345	1	1	SOUTH	345 SOUTH	138	1	0	60	1950	--	VL	--	0.9812
SPRINGR	345 LUNA	345	1	1	VAIL2	345 VAIL	138	1	0	40	1950	--	VL	--	0.9804
SPRINGR	345 VAIL2	345	1	1	BICKNELL	345 VAIL	345	1	1	40	1950	--	VL	--	0.9866
SPRINGR	345 VAIL2	345	1	1	SOUTH	345 GATEWAY	345	1	1	40	1950	--	VL	--	0.9856
SPRINGR	345 VAIL2	345	1	1	SOUTH	345 GATEWAY	345	2	1	40	1950	--	VL	--	0.9857
WESTWING	345 SOUTH	345	1	1	CHOLLA	500 SAGUARO	500	1	1	40	1950	--	VL	--	0.9832
GREENLEE	345 WINCHSTR	345	1	1	CHOLLA	500 SAGUARO	500	1	1	40	1950	--	VL	--	0.986
HIDALGO	345 GREENLEE	345	1	1	SOUTH	345 SOUTH	138	1	0	20	1950	--	--	TH	0.9912
SPRINGR	345 LUNA	345	1	1	WINCHSTR	345 VAIL	345	1	1	20	1950	--	VL	--	0.9841
SPRINGR	345 LUNA	345	1	1	CHOLLA	500 SAGUARO	500	1	1	20	1950	--	VL	--	0.9834
SPRINGR	345 CORONADO	345	1	1	SOUTH	345 SOUTH	138	1	0	20	1950	--	VL	--	0.9852
SPRINGR	345 GREENLEE	345	1	1	WINCHSTR	345 VAIL	345	1	1	20	1950	--	VL	--	0.9801
SPRINGR	345 VAIL2	345	1	1	VAIL	345 SOUTH	345	1	1	20	1950	--	VL	--	0.9848
SPRINGR	345 VAIL2	345	1	1	GREEN-AE	345 GREENLEE	345	1	1	20	1950	--	VL	--	0.9862
SPRINGR	345 VAIL2	345	1	1	WINCHSTR	345 WINCHSTR	230	1	0	20	1950	--	VL	--	0.9862
SPRINGR	345 VAIL2	345	1	1	WINCHSTR	345 WINCHSTR	230	2	0	20	1950	--	VL	--	0.9862
VAIL	345 SOUTH	345	1	1	WINCHSTR	345 VAIL	345	1	1	20	1950	--	VL	--	0.9846
VAIL	345 SOUTH	345	1	1	VAIL2	345 VAIL	138	1	0	20	1950	--	VL	--	0.9857
BICKNELL	345 VAIL	345	1	1	VAIL2	345 VAIL	138	1	0	20	1950	--	VL	--	0.9806
SOUTH	345 GATEWAY	345	1	1	VAIL2	345 VAIL	138	1	0	20	1950	--	VL	--	0.9801
SOUTH	345 GATEWAY	345	2	1	VAIL2	345 VAIL	138	1	0	20	1950	--	VL	--	0.9801
WINCHSTR	345 VAIL	345	1	1	VAIL	345 VAIL	138	1	0	20	1950	--	VL	--	0.98

Gtway+Bowie_a.sav FROM BOWIE POWER STATION, LCC
REVISED SYSTEM IMPACT STUDY, 2005 HEAVY SUMMER
Bowie put in NB2B_RLG case, for high load two county.
2nd Bicknell xfmr not in case. GEN AUX LDS WERE OFF, TURNED ON.

NETGEN: 145

Outages below are NERC level D. These are outages that must be survived according to TEP internal criteria.

WINCHSTR	345 VAIL	345	2	1 SPRINGR	345 VAIL2	345	1	1	BICKNELL	345 BICKNELL	230	1	0	650	2000	DS	VL	TH	1.0422	OL,MAX SHD	TORTOLIT	138 N. LOOP	138	1	351.5	344
																					TORTOLIT	138 N. LOOP	138	2	351.5	344
																					THREEPNT	115 AVRA	115	1	83	78.9
																					SONOITA	115 VALENCIA	115	1	79.7	67.2
																					BICKNELL	230 BICKNELL	115	1	122.4	112
SAN_JUAN	345 MCKINLEY	345	1	1 WINCHSTR	345 VAIL	345	2	1						500	2000	--	VL	TH	1.0526	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	241.7	193
SAN_JUAN	345 MCKINLEY	345	1	1 SOUTH	345 SOUTH	138	1	0						220	2000	--	--	TH	1.0296							
SAN_JUAN	345 MCKINLEY	345	2	1 WINCHSTR	345 VAIL	345	2	1						500	2000	--	VL	TH	1.0526	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	241.7	193
SAN_JUAN	345 MCKINLEY	345	2	1 SOUTH	345 SOUTH	138	1	0						220	2000	--	--	TH	1.0296							
HIDALGO	345 GREENLEE	345	1	1 SPRINGR	345 LUNA	345	1	1						650	2000	DS	--	--	1.0296	MAX SHD,NS						
HIDALGO	345 GREENLEE	345	1	1 VAIL	345 SOUTH	345	1	1						100	2000	--	--	TH	1.0314							
HIDALGO	345 GREENLEE	345	1	1 WINCHSTR	345 VAIL	345	2	1						520	2000	--	VL	TH	1.0502	VOLTS HIGH	APACHE	230 BUTERFLD	230	1	416.5	368.1
																					BICKNELL	345 BICKNELL	230	1	296.2	193
HIDALGO	345 GREENLEE	345	1	1 SOUTH	345 SOUTH	138	1	0						280	2000	--	--	TH	1.0391							
SAGUARO	500 TORTOLIT	500	1	1 SAGUARO	500 TORTLIT2	500	1	1						180	2000	DS	VL	--	0.9876							
SAGUARO	500 TORTOLIT	500	1	1 WINCHSTR	345 VAIL	345	2	1						500	2000	DS	VL	TH	1.0506	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	250.6	193
SAGUARO	500 TORTOLIT	500	1	1 SOUTH	345 SOUTH	138	1	0						300	2000	--	VL	TH	1.0394							
SAGUARO	500 TORTOLIT	500	1	1 TORTOLIT	138 TORTLIT2	500	1	0						180	2000	DS	VL	--	0.986							
MCKINLEY	345 SPRINGR	345	1	1 WINCHSTR	345 VAIL	345	2	1						500	2000	--	VL	TH	1.0515	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	241.6	193
MCKINLEY	345 SPRINGR	345	1	1 SOUTH	345 SOUTH	138	1	0						220	2000	--	--	TH	1.0293							
MCKINLEY	345 SPRINGR	345	2	1 WINCHSTR	345 VAIL	345	2	1						500	2000	--	VL	TH	1.0519	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	241.7	193
MCKINLEY	345 SPRINGR	345	2	1 SOUTH	345 SOUTH	138	1	0						220	2000	--	--	TH	1.0291							
SPRINGR	345 LUNA	345	1	1 WINCHSTR	345 VAIL	345	2	1						500	2000	--	VL	TH	1.0512	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	222.3	193
SPRINGR	345 LUNA	345	1	1 SOUTH	345 SOUTH	138	1	0						200	2000	--	--	TH	1.0228							
SPRINGR	345 CORONADO	345	1	1 SPRINGR	345 VAIL2	345	1	1						260	2000	--	--	TH	1.0474							
SPRINGR	345 CORONADO	345	1	1 VAIL	345 SOUTH	345	1	1						300	2000	--	--	TH	1.0459							
SPRINGR	345 CORONADO	345	1	1 WINCHSTR	345 VAIL	345	2	1						580	2000	DS	VL	TH	1.0521	VOLTS HIGH	APACHE	230 BUTERFLD	230	1	375.5	368.1
																					BICKNELL	345 BICKNELL	230	1	252	193
SPRINGR	345 CORONADO	345	1	1 SOUTH	345 SOUTH	138	1	0						300	2000	--	--	TH	1.0366							
SPRINGR	345 CORONADO	345	1	1 VAIL2	345 VAIL	138	1	0						260	2000	--	--	TH	1.0467							
SPRINGR	345 GREENLEE	345	1	1 WINCHSTR	345 VAIL	345	2	1						500	2000	--	VL	TH	1.051	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	236	193
SPRINGR	345 GREENLEE	345	1	1 SOUTH	345 SOUTH	138	1	0						160	2000	--	VL	TH	1.0135							
SPRINGR	345 VAIL2	345	1	1 VAIL	345 SOUTH	345	1	1						480	2000	--	--	TH	1.0482							
SPRINGR	345 VAIL2	345	1	1 WESTWING	345 SOUTH	345	1	1						40	2000	--	--	TH	1.0022							
SPRINGR	345 VAIL2	345	1	1 WINCHSTR	345 VAIL	345	2	1						650	2000	DS	VL	TH	1.048	OL,MAX SHD	APACHE	230 BUTERFLD	230	1	444.8	368.1
																					BUTERFLD	230 PANTANO	230	1	389.4	368.1
																					BICKNELL	345 BICKNELL	230	1	347.4	193
SPRINGR	345 VAIL2	345	1	1 WINCHSTR	345 WILLOW	345	1	1						120	2000	DS	VL	--	0.9838		APACHE	230 WINCHSTR	230	1	509.8	483
SPRINGR	345 VAIL2	345	1	1 CHOLLA	500 SAGUARO	500	1	1						460	2000	--	--	TH	1.0437							
SPRINGR	345 VAIL2	345	1	1 WESTWING	500 WESTWING	345	1	0						80	2000	--	--	TH	1.0232							
SPRINGR	345 VAIL2	345	1	1 SOUTH	345 SOUTH	138	1	0						560	2000	DS	VL	TH	1.0502	VOLTS HIGH						
SPRINGR	345 VAIL2	345	1	1 VAIL	345 VAIL	138	1	0						380	2000	DS	VL	TH	1.0314							
VAIL	345 SOUTH	345	1	1 WESTWING	345 SOUTH	345	1	1						280	2000	--	--	TH	1.0483							
VAIL	345 SOUTH	345	1	1 WINCHSTR	345 VAIL	345	2	1						520	2000	--	VL	TH	1.0522	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	207.7	193
VAIL	345 SOUTH	345	1	1 CHOLLA	500 SAGUARO	500	1	1						400	2000	--	--	TH	1.0462							
VAIL	345 SOUTH	345	1	1 WESTWING	500 WESTWING	345	1	0						280	2000	--	--	TH	1.0453							
VAIL	345 SOUTH	345	1	1 SOUTH	345 SOUTH	138	1	0						260	2000	--	VL	TH	1.0316							
VAIL	345 SOUTH	345	1	1 VAIL	345 VAIL	138	1	0						160	2000	DS	VL	--	0.9866		THREEPNT	115 AVRA	115	1	88	78.9
																					BICKNELL	230 BICKNELL	115	1	131	112
VAIL	345 SOUTH	345	1	1 VAIL2	345 VAIL	138	1	0						480	2000	--	--	TH	1.0488							
WESTWING	345 SOUTH	345	1	1 WINCHSTR	345 VAIL	345	2	1						500	2000	DS	VL	TH	1.0512	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	259.8	193
WESTWING	345 SOUTH	345	1	1 SOUTH	345 SOUTH	138	1	0						260	2000	--	--	TH	1.0383							
WESTWING	345 SOUTH	345	1	1 VAIL2	345 VAIL	138	1	0						40	2000	--	--	TH	1.0028							
BICKNELL	345 VAIL	345	1	1 WINCHSTR	345 VAIL	345	2	1						140	2000	DS	VL	--	0.9823							
BICKNELL	345 VAIL	345	1	1 SOUTH	345 SOUTH	138	1	0						240	2000	--	--	TH	1.0321							
GREEN-AE	345 GREENLEE	345	1	1 WINCHSTR	345 VAIL	345	2	1						500	2000	--	VL	TH	1.0517	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	240.7	193
GREEN-AE	345 GREENLEE	345	1	1 SOUTH	345 SOUTH	138	1	0						240	2000	--	--	TH	1.0325							

Gtway+Bowie_a.sav FROM BOWIE POWER STATION, LCC
REVISED SYSTEM IMPACT STUDY, 2005 HEAVY SUMMER
Bowie put in NB2B_RLG case, for high load two county.
2nd Bicknell xfmr not in case. GEN AUX LDS WERE OFF, TURNED ON.

NETGEN: 145
Outages below are NERC level D. These are outages that must be survived according to TEP internal criteria.

SAGUARO	500	TORTLIT2	500	1	1	WINCHSTR	345	VAIL	345	2	1	500	2000	DS	VL	TH	1.0506	VOLTS HIGH	BICKNELL	345	BICKNELL	230	1	250.6	193
SAGUARO	500	TORTLIT2	500	1	1	SOUTH	345	SOUTH	138	1	0	300	2000	–	VL	TH	1.0394								
SAGUARO	500	TORTLIT2	500	1	1	TORTOLIT	138	TORTOLIT	500	1	0	180	2000	DS	VL	–	0.986								
SOUTH	345	GATEWAY	345	1	1	WINCHSTR	345	VAIL	345	2	1	560	2000	–	VL	TH	1.0516	VOLTS HIGH	BICKNELL	345	BICKNELL	230	1	234.4	193
SOUTH	345	GATEWAY	345	1	1	SOUTH	345	SOUTH	138	1	0	240	2000	–	–	TH	1.0291								
SOUTH	345	GATEWAY	345	2	1	WINCHSTR	345	VAIL	345	2	1	560	2000	–	VL	TH	1.0516	VOLTS HIGH	BICKNELL	345	BICKNELL	230	1	234.4	193
SOUTH	345	GATEWAY	345	2	1	SOUTH	345	SOUTH	138	1	0	240	2000	–	–	TH	1.0291								
WINCHSTR	345	VAIL	345	2	1	GREENLEE	345	WILLOW	345	1	1	600	2000	DS	VL	TH	1.0517	VOLTS HIGH	APACHE	230	BUTERFLD	230	1	473.2	368.1
																			BUTERFLD	230	PANTANO	230	1	414	368.1
																			PANTANO	230	SAHUARIT	230	1	376.3	368.1
																			SAHUARIT	230	BICKNELL	230	1	375.4	368.1
																			APACHE	230	WINCHSTR	230	1	521.5	483
																			BICKNELL	345	BICKNELL	230	1	360.5	193
WINCHSTR	345	VAIL	345	2	1	WINCHSTR	345	WILLOW	345	1	1	500	2000	–	VL	TH	1.0518	VOLTS HIGH	BICKNELL	345	BICKNELL	230	1	222.4	193
WINCHSTR	345	VAIL	345	2	1	WILLOW	345	BOWIE	345	1	1	500	2000	–	VL	TH	1.0515	VOLTS HIGH	BICKNELL	345	BICKNELL	230	1	242.3	193
WINCHSTR	345	VAIL	345	2	1	WILLOW	345	BOWIE	345	2	1	500	2000	–	VL	TH	1.0518	VOLTS HIGH	BICKNELL	345	BICKNELL	230	1	242.3	193
WINCHSTR	345	VAIL	345	2	1	CHOLLA	500	SAGUARO	500	1	1	640	2000	DS	VL	TH	1.0505	VOLTS HIGH	APACHE	230	BUTERFLD	230	1	386.3	368.1
																			BICKNELL	345	BICKNELL	230	1	251.5	193
WINCHSTR	345	VAIL	345	2	1	WESTWING	500	WESTWING	345	1	0	460	2000	DS	VL	TH	1.0551	VOLTS HIGH	BICKNELL	345	BICKNELL	230	1	273.4	193
WINCHSTR	345	VAIL	345	2	1	CORONADO	500	CORONADO	345	1	0	500	2000	–	VL	TH	1.051	VOLTS HIGH	BICKNELL	345	BICKNELL	230	1	243.8	193
WINCHSTR	345	VAIL	345	2	1	CORONADO	500	CORONADO	345	2	0	500	2000	–	VL	TH	1.0507	VOLTS HIGH	BICKNELL	345	BICKNELL	230	1	243.7	193
WINCHSTR	345	VAIL	345	2	1	MCKINLEY	345	YAHTAHEY	115	1	0	500	2000	–	VL	TH	1.0514	VOLTS HIGH	BICKNELL	345	BICKNELL	230	1	242.6	193
WINCHSTR	345	VAIL	345	2	1	SOUTH	345	SOUTH	138	1	0	560	2000	DS	VL	TH	1.0511	VOLTS HIGH	BICKNELL	345	BICKNELL	230	1	225.9	193
WINCHSTR	345	VAIL	345	2	1	VAIL	345	VAIL	138	1	0	500	2000	–	VL	TH	1.0526	VOLTS HIGH	BICKNELL	345	BICKNELL	230	1	238.2	193
WINCHSTR	345	VAIL	345	2	1	VAIL2	345	VAIL	138	1	0	650	2000	DS	VL	TH	1.0491	OL,MAX SHD	APACHE	230	BUTERFLD	230	1	444.3	368.1
																			BUTERFLD	230	PANTANO	230	1	389	368.1
																			BICKNELL	345	BICKNELL	230	1	347.2	193
WINCHSTR	345	VAIL	345	2	1	TORTOLIT	138	TORTOLIT	500	1	0	500	2000	DS	VL	TH	1.0507	VOLTS HIGH	BICKNELL	345	BICKNELL	230	1	250.6	193
WINCHSTR	345	VAIL	345	2	1	TORTOLIT	138	TORTLIT2	500	1	0	500	2000	DS	VL	TH	1.0505	VOLTS HIGH	BICKNELL	345	BICKNELL	230	1	250.6	193
WINCHSTR	345	VAIL	345	2	1	WINCHSTR	345	WINCHSTR	230	1	0	500	2000	–	VL	TH	1.0518	VOLTS HIGH	BICKNELL	345	BICKNELL	230	1	240.8	193
WINCHSTR	345	VAIL	345	2	1	WINCHSTR	345	WINCHSTR	230	2	0	500	2000	–	VL	TH	1.0515	VOLTS HIGH	BICKNELL	345	BICKNELL	230	1	240.8	193
GREENLEE	345	WILLOW	345	1	1	WINCHSTR	345	WILLOW	345	1	1	40	2000	DS	–	–	1.0515	MISM_DIV							
GREENLEE	345	WILLOW	345	1	1	SOUTH	345	SOUTH	138	1	0	240	2000	–	–	TH	1.0326								
WINCHSTR	345	WILLOW	345	1	1	CHOLLA	500	SAGUARO	500	1	1	100	2000	DS	VL	TH	0.9957								
WINCHSTR	345	WILLOW	345	1	1	SOUTH	345	SOUTH	138	1	0	80	2000	–	VL	–	0.9856								
WINCHSTR	345	WILLOW	345	1	1	VAIL2	345	VAIL	138	1	0	120	2000	DS	VL	–	0.9849		APACHE	230	WINCHSTR	230	1	509.8	483
WILLOW	345	BOWIE	345	1	1	WILLOW	345	BOWIE	345	2	1	40	2000	DS	–	–	0.9849	MISM_DIV							
WILLOW	345	BOWIE	345	1	1	SOUTH	345	SOUTH	138	1	0	240	2000	–	–	TH	1.0332								
WILLOW	345	BOWIE	345	2	1	SOUTH	345	SOUTH	138	1	0	240	2000	–	–	TH	1.0332								
CHOLLA	500	SAGUARO	500	1	1	SOUTH	345	SOUTH	138	1	0	580	2000	DS	VL	TH	1.0457								
CHOLLA	500	SAGUARO	500	1	1	VAIL	345	VAIL	138	1	0	80	2000	–	VL	–	0.9828								
CHOLLA	500	SAGUARO	500	1	1	VAIL2	345	VAIL	138	1	0	460	2000	–	–	TH	1.0439								
WESTWING	500	WESTWING	345	1	0	SOUTH	345	SOUTH	138	1	0	260	2000	–	–	TH	1.0464								
WESTWING	500	WESTWING	345	1	0	VAIL2	345	VAIL	138	1	0	80	2000	–	–	TH	1.0236								
CORONADO	500	CORONADO	345	1	0	SOUTH	345	SOUTH	138	1	0	240	2000	–	–	TH	1.0325								
CORONADO	500	CORONADO	345	2	0	SOUTH	345	SOUTH	138	1	0	240	2000	–	–	TH	1.0325								
MCKINLEY	345	YAHTAHEY	115	1	0	SOUTH	345	SOUTH	138	1	0	240	2000	–	–	TH	1.0325								
SOUTH	345	SOUTH	138	1	0	VAIL	345	VAIL	138	1	0	420	2000	DS	VL	–	0.9894								
SOUTH	345	SOUTH	138	1	0	VAIL2	345	VAIL	138	1	0	560	2000	DS	VL	TH	1.0505	VOLTS HIGH							
SOUTH	345	SOUTH	138	1	0	TORTOLIT	138	TORTOLIT	500	1	0	300	2000	–	VL	TH	1.0378								
SOUTH	345	SOUTH	138	1	0	TORTOLIT	138	TORTLIT2	500	1	0	300	2000	–	VL	TH	1.0378								
SOUTH	345	SOUTH	138	1	0	WINCHSTR	345	WINCHSTR	230	1	0	240	2000	–	–	TH	1.033								
SOUTH	345	SOUTH	138	1	0	WINCHSTR	345	WINCHSTR	230	2	0	240	2000	–	–	TH	1.033								
VAIL	345	VAIL	138	1	0	VAIL2	345	VAIL	138	1	0	380	2000	DS	VL	TH	1.0318								
TORTOLIT	138	TORTOLIT	500	1	0	TORTOLIT	138	TORTLIT2	500	1	0	180	2000	DS	VL	–	0.9858								
SAN_JUAN	345	MCKINLEY	345	1	1	WINCHSTR	345	VAIL	345	2	1	500	2000	–	VL	TH	1.0524	VOLTS HIGH	BICKNELL	345	BICKNELL	230	1	241.7	193
SAN_JUAN	345	MCKINLEY	345	2	1	WINCHSTR	345	VAIL	345	2	1	500	2000	–	VL	TH	1.0526	VOLTS HIGH	BICKNELL	345	BICKNELL	230	1	241.7	193

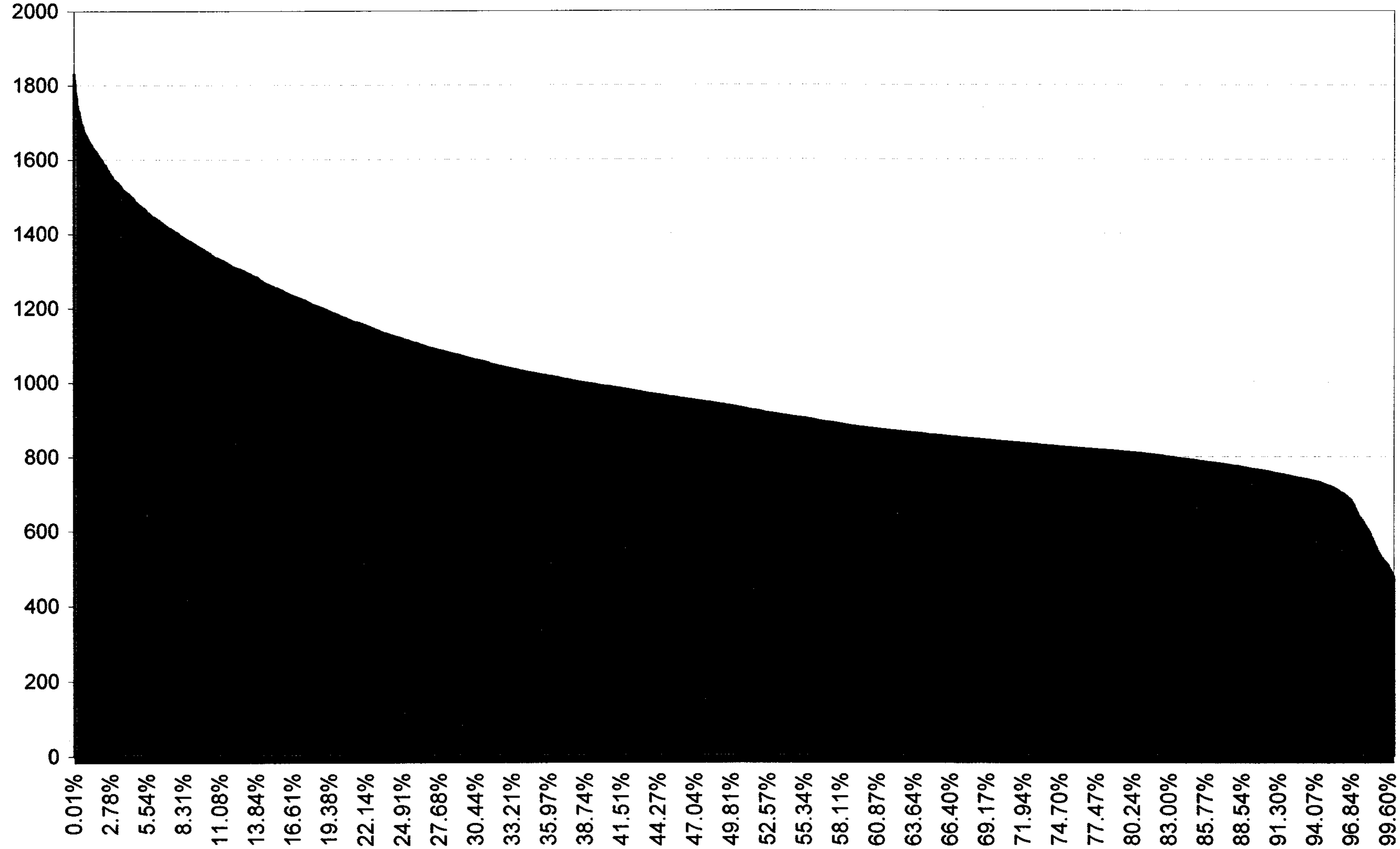
Gtway+Bowie_a.sav FROM BOWIE POWER STATION, LCC
REVISED SYSTEM IMPACT STUDY, 2005 HEAVY SUMMER
Bowie put in NB2B_RLG case, for high load two county.
2nd Bicknell xfmr not in case. GEN AUX LDS WERE OFF, TURNED ON.

NETGEN: 145

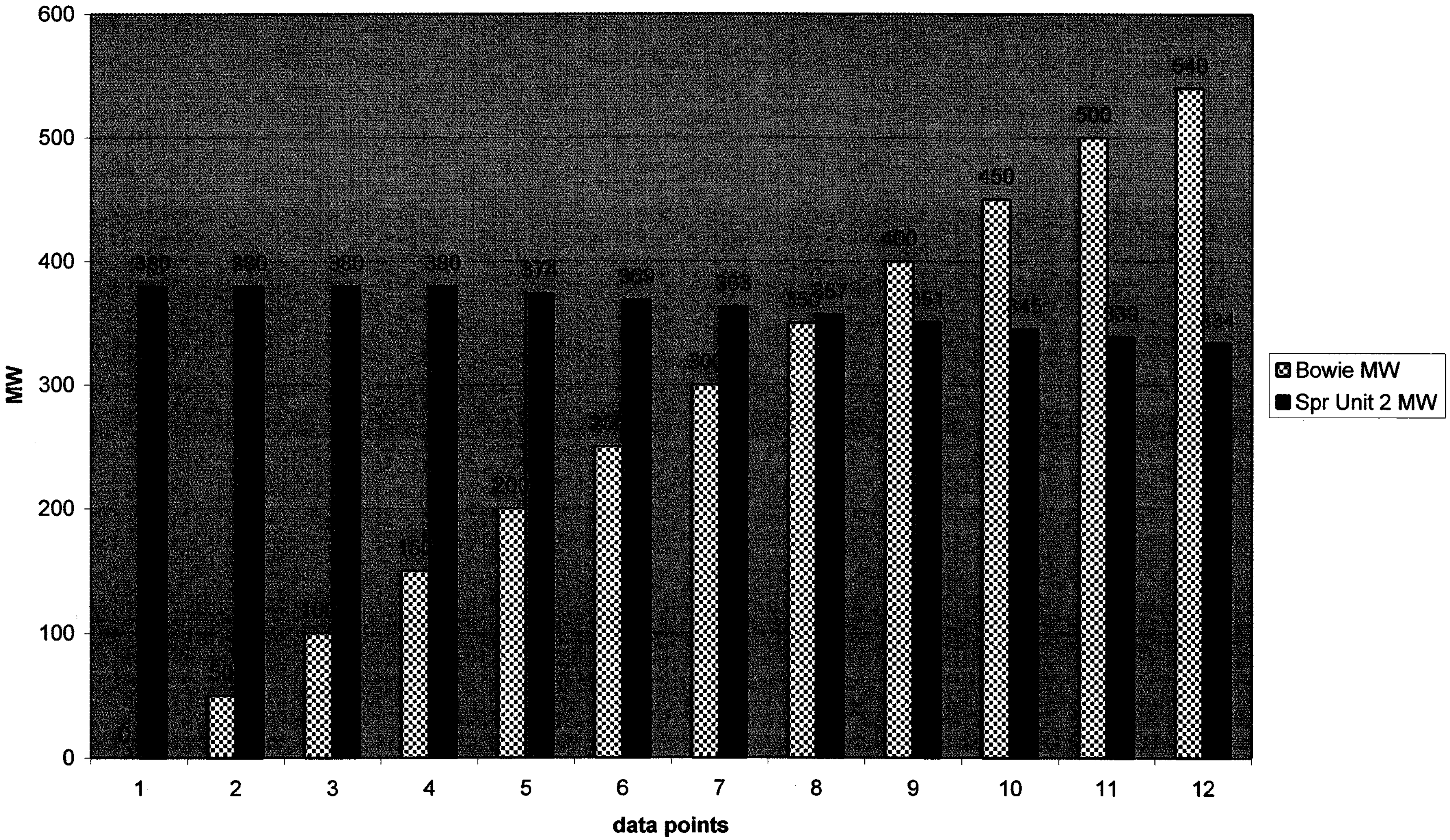
Outages below are NERC level D. These are outages that must be survived according to TEP internal criteria.

HIDALGO	345 GREENLEE	345	1	1	WINCHSTR	345 VAIL	345	2	1	520	2000	--	VL	TH	1.0503	VOLTS HIGH	APACHE	230 BUTERFLD	230	1	416.4	368.1
																	BICKNELL	345 BICKNELL	230	1	296.1	193
MCKINLEY	345 SPRINGR	345	1	1	WINCHSTR	345 VAIL	345	2	1	500	2000	--	VL	TH	1.0515	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	241.6	193
MCKINLEY	345 SPRINGR	345	2	1	WINCHSTR	345 VAIL	345	2	1	500	2000	--	VL	TH	1.052	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	241.7	193
SPRINGR	345 LUNA	345	1	1	WINCHSTR	345 VAIL	345	2	1	500	2000	--	VL	TH	1.051	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	222.2	193
SPRINGR	345 GREENLEE	345	1	1	WINCHSTR	345 VAIL	345	2	1	500	2000	--	VL	TH	1.051	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	236	193
VAIL	345 SOUTH	345	1	1	WINCHSTR	345 VAIL	345	2	1	520	2000	--	VL	TH	1.0521	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	207.6	193
GREEN-AE	345 GREENLEE	345	1	1	WINCHSTR	345 VAIL	345	2	1	500	2000	--	VL	TH	1.0515	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	240.7	193
SOUTH	345 GATEWAY	345	1	1	WINCHSTR	345 VAIL	345	2	1	560	2000	--	VL	TH	1.0525	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	234.8	193
SOUTH	345 GATEWAY	345	2	1	WINCHSTR	345 VAIL	345	2	1	560	2000	--	VL	TH	1.0521	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	234.6	193
WINCHSTR	345 VAIL	345	2	1	WILLOW	345 BOWIE	345	1	1	500	2000	--	VL	TH	1.0518	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	242.3	193
WINCHSTR	345 VAIL	345	2	1	WILLOW	345 BOWIE	345	2	1	500	2000	--	VL	TH	1.0515	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	242.3	193
WINCHSTR	345 VAIL	345	2	1	CORONADO	500 CORONADO	345	1	0	500	2000	--	VL	TH	1.051	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	243.8	193
WINCHSTR	345 VAIL	345	2	1	CORONADO	500 CORONADO	345	2	0	500	2000	--	VL	TH	1.0507	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	243.7	193
WINCHSTR	345 VAIL	345	2	1	MCKINLEY	345 YAHTAHEY	115	1	0	500	2000	--	VL	TH	1.0514	VOLTS HIGH	BICKNELL	345 BICKNELL	230	1	242.6	193

2001 Hourly Retail Load



**Max MW possible on Spr Unit 2 for Two County Compliance at Bowie MW Gen levels
800 TEP load, PS IN**



EXHIBITS

EXHIBIT A

Legal Description: Proposed Route of Bowie 345kV Transmission Line

As shown on General Corridor Map (Exhibit B), a strip of land 2,500 feet in width and being located in Cochise and Graham Counties, Arizona, the centerline of said strip of land being described as follows:

Beginning at the Northwest boundary of the Bowie Power Station's 345kV switchyard, located in the SE ¼ of the NE ¼ of Section 29, Township 12 South, Range 28 East, Gila and Salt River Base and Meridian, Cochise County Arizona, said point being located at Latitude 32°21'54"N, Longitude 109°30'8"W;

Thence Northwesterly 959 feet to a point located in the NE ¼ of the NE ¼ of Section 29, T12S, R28E at Latitude 32°22'2"N, Longitude 109°30'13"W;

Thence North-northwesterly paralleling the Arizona Eastern Railroad 18,965 feet to a point located in the NE ¼ of the SE ¼ of Section 6, T12S, R28E, Graham County, Arizona, at Latitude 32°25'3"N, Longitude 109°31'11"W;

Thence Northwesterly crossing the Arizona Eastern Railroad 13,653 feet to a point located in the SE ¼ of the SE ¼ of Section 26, T11S, R27E at Latitude 32°26'31"N, Longitude 109°33'12"W;

Thence Westerly 11,901 feet to a point located in the SW ¼ of the SE ¼ of Section 28, T11S, R27E at Latitude 32°26'29"N, Longitude 109°35'31"W;

Thence West-northwesterly 6,079 feet to a point located in the NW ¼ of the SE ¼ of Section 29, T11S, R27E at Latitude 32°26'46"N, Longitude 109°36'39"W;

Thence Westerly 11,000 feet to a point in the NE ¼ of the SW ¼ of Section 25, T11S, R26E at Latitude 32°26'47"N, Longitude 109°38'47"W;

Thence Northwesterly 10,938 feet to a point in the SE ¼ of the SW ¼ of Section 14, T11S, R26E at Latitude 32°28'20"N, Longitude 109°39'52"W;

Thence West-northwesterly to a point in the SW ¼ of Section 14, T11S, R26E; said point being the point of terminus at the proposed interconnection of the Bowie 345kV transmission line with either or both the 345kV Springerville-Vail and 345kV Greenlee-Vail transmission lines at or near the proposed Willow Switchyard (substation) site.

Proposed Willow Switchyard (substation)

The proposed Willow Switchyard will be located on a parcel of land of approximately 23 acres within the SW ¼ of Section 14, Township 11 South, Range 26 East, Gila and Salt River Base and Meridian, Graham County, Arizona.

EXHIBIT B

Bowie 345kV Transmission Line
General Corridor Map